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CULTIVATION OF THE APPLE IN CANADA

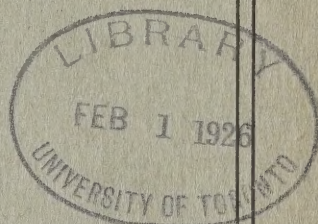
WITH

DESCRIPTIONS AND LISTS OF VARIETIES

BY

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE

BULLETIN No. 55—NEW SERIES

DIVISION OF HORTICULTURE
DOMINION EXPERIMENTAL FARMS

Published by direction of the Hon. W. R. MOTHERWELL, Minister of Agriculture,
Ottawa, 1925



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CULTIVATION OF THE APPLE IN CANADA

By M. B. Davis, B.S.A.

INTRODUCTION

This bulletin is designed as a supplement to bulletin No. 18, N.S., "Modern Orchard Practices", and the two combined are intended to replace bulletin No. 86, E.F., "The Apple in Canada", by W. T. Macoun, Dominion Horticulturist.

The present publication deals with apple orcharding in its early phases, such as laying out the orchard, selection of trees and so forth. In addition there is a treatise of a considerable number of the better-known varieties of apples. Bulletin No. 18, on the other hand, deals more with regular orchard practices, including a discussion of some of the fundamentals essential to a clearer conception of the orchardist's problems.

SELECTION OF THE LOCATION

By the selection of the location for an orchard is meant the locality in which the orchardist intends to locate. Of course, those persons already residing in a district and wishing to plant would not be able to take this point into the same consideration as one who is free to choose his location, although a consideration of the factors governing such a selection might have a profound influence on the extent of the area planted. There are two main considerations in locating: (1) suitability of the locality for orcharding, and (2) marketing facilities available.

SUITABILITY OF THE LOCALITY.—Under this heading must be considered the question of general climatic conditions, such as rainfall, sunshine, winter temperatures and snowfall. In districts having less than twenty to twenty-five inches of rainfall annually, well distributed through the growing season, the chances of success without irrigation are much less than where the rainfall is equal to or greater than these amounts. As apple trees are exorbitant in their demands upon soil moisture, due attention must be paid to this phase. Where irrigation is possible at a reasonable rate per acre, the matter of rainfall is unimportant, but the grower must be assured of a continuous supply of irrigation water before making his planting.

Another phase of moisture conditions has to do with districts where the humidity is apt to be excessive during the fruiting season, involving much expenditure in the control of fungous diseases. Although there is probably no part of Canada where humidity is so excessive that it cannot be controlled, nevertheless there is much variation in this respect, and consequently a difference in cost of production with respect to spraying. Other things being equal, districts where disease, such as apple scab, is easy of control are preferable.

SUNSHINE, upon which fruit growers are dependent very largely for their development of high colour, a prime requisite of the market, is an important consideration. Hand in hand with sunshine, and dependent largely upon it, is summer temperature. Where the season is short and comparatively cool, it becomes difficult to grow fruit of sufficiently high colour, and market prices suffer accordingly.

WINTER TEMPERATURES bear a considerable part in determining the location of an orchard. In some areas, such as parts of Ontario, Nova Scotia and British Columbia, loss from winter injury due to low temperatures in winter is seldom known. Thus for these districts the grower is not obliged to figure loss from this source in his orchard. This, however, does not necessarily mean that districts suffering occasionally from winter injury are not as profitable as the others, for they may possess other features which will offset this disadvantage. Due consideration must, however, be given to winter temperatures in reckoning up the probable life of the orchard and the chances of a complete return of capital invested together with a reasonable interest earning.

MARKETING FACILITIES AVAILABLE.—This is probably the most important consideration of all. A district with an excellent market for its product has an advantage which will largely, if not wholly, offset its disadvantages with regard to winter injury, providing that the loss from this source is not of such a frequent recurrence that the grower is not reasonably assured of, say, fifteen years of crops from the major portion of his trees. Fifteen crops, marketed at a profitable figure, is a better investment than a life time of endeavour at cost or little better. There are fruit areas in Canada which have been largely neglected owing to the timidity of orchardists with respect to winter injury, yet these same areas having excellent marketing facilities, show an annual net profit far in excess of many more favoured localities. The growers are thus able to absorb annually a large part of the initial investment, which, at the expiration of the profitable life of the venture, enables them to recommence operations without any impairment of their original investment. Without drawing any attention to districts in particular, the writer wishes to stress the importance of considering the marketing possibilities. Too much attention has been paid in the past to the possibility of growing the crop amidst the most ideal surroundings with respect to production and culture. Is the contemplated location of your orchard assured of a home market? Is it assured of a distant or foreign market at prices sufficiently remunerative to pay freight charges and leave a balance large enough to meet production cost and profit charges? In general a home market is to be preferred and the location of orcharding ventures near our large centres of population, unless the district is already exporting fruit, is a pretty sound business venture.

SELECTION OF THE SITE.—After the location of district or area in general has been decided upon, the question of site should receive attention. In this connection such factors as distance from shipping point, roads, topographical formation, drainage and soil must be analysed. The advantage of a short haul to a shipping point is obvious, but frequently cost of land is a factor determining this point. Unless the more distant site can be obtained at a figure sufficiently lower than the closer one, so that the interest on the difference in initial cost will take care of increased transportation charges, the distant location is the less desirable.

Good roads at all seasons is an imperative need for any successful orchard venture.

Correct topographical formation is of special value for surface drainage of water and correct air drainage. In parts of the country subject to severe winter temperatures, the question of a proper site with respect to elevation is of the utmost importance. Orchards located in a hollow or low area, surrounded by higher land, suffer much from not only late spring frost but from winter injury in severe years. A gentle slope with lower-lying land at the base of the slope, to which the colder air may drain, is desirable. The advantages of such a location were made apparent at the Central Experimental Farm during the winter of 1917-18. An orchard located on a side hill with a gentle slope came through

the winter in excellent condition, while that portion of the same orchard located on the low land at the base of the slope suffered materially. The exact figures of the amount of injury sustained by the trees on the ridge as compared with those at the base were:—

Trees on the ridge 16 per cent injury.

Trees at the base 50 per cent injury.

The difference in elevation between these two points is about seven feet and the distance only between two and three hundred feet. It is abundantly evident from this that care in site selection will be amply repaid.

Not only is loss from winter injury greatly reduced by proper site location, but also injury from late spring frosts may in many instances be entirely eliminated. Temperatures taken in spring during frosty nights showed a difference of 5 degrees in elevations of four feet in variation and only some one hundred feet distant from each other. Such a discrepancy is sufficient to cause the difference between loss and success.



FIG. 1.

Tillage had to be abandoned at the close of an eleven-year period in this orchard, as gullies in some parts of the orchard had cut down to the drainage tiles laid between the rows. (Photo by F. H. Ballou. Courtesy of Ohio Agricultural Experiment Station.)

DRAINAGE.—Apple trees will not stand wet feet. A good orchard site provides ample surface drainage to take care of excess water in late winter and early spring when drainage through the soil is difficult owing to frost. In addition to surface drainage, soil or under-drainage is essential. Good natural drainage of the soil is preferable to tile drains, unless the latter are sufficiently deep to be beyond the danger of penetration by the roots of the trees.

SOIL CONSIDERATIONS.—Although there is undoubtedly some preference of apple varieties for different types of soil, nevertheless, most varieties flourish to a large extent over a considerable range. Probably the type of subsoil on the proposed site is as important, if not more so, than the kind and quality of the surface soil. The subsoil should be such as to allow of good drainage, so that

roots of trees will at no time be standing in water, and it should be sufficiently penetrable to permit the roots to make an extended growth. A subsoil which is hard and impervious restricts the root development of a tree, with a subsequent effect on its life and vigour. Of course, a very open subsoil, not at all retentive of water, is the other extreme and is to be as equally avoided as the impervious. An ideal type is a rather gravelly loam. Such a subsoil is decidedly better than a hard-pan, a stiff hard clay, or a loose sand. Good depth of subsoil is essential for best results; from six to eight feet is almost a necessity for successful orcharding. The use of a spade or soil auger will soon exhibit to the prospective



FIG. 2.

Orchard grown under the grass-mulch system. The trees on the left have been mulched with one bale of straw per tree. This system is recommended especially where the orchard is in the condition shown in Fig. 1. (Photo. by F. H. Ballou. Courtesy of Ohio Agricultural Experiment Station.)

planter the type and depth of the underlying soil. Apples thrive on a great variety of surface soils from drift sand to heavy clay. In many of our best fruit sections both types are to be found. From the standpoint of ease of working, a sand or loam (either clay loam or sandy loam) is to be desired. At the Central Experimental Farm, Ottawa, the orchard is located on the poorest of sand. This soil is easy to work at all seasons, but is necessarily poor in plant food, and has required considerable attention in this connection. By the judicious use of fertilizer and cover crop, however, it has been possible to maintain average vigour and productiveness on a soil of little value for general farm purposes.

The keeping quality of apples is materially affected by the type of soil. Fruit grown on the lighter sands does not keep as well as that grown on heavier soils, and in many instances the quality of the fruit on the heavier soils is superior. Heavy clays which tend to bake are, however, to be avoided and more especially in districts of the more severe climate. A sand, although not as desirable as a good friable loam, is superior to a heavy, stiff clay. It is easier to incorporate sufficient plant food in the sand than to greatly improve the physical texture of the stiff clay. Although, as has been stated, apples in general are rather adaptable to a wide range of soils, there are a few varieties known to be more exacting in this respect. The Northern Spy, for instance, does infinitely better on a moderately heavy soil with a heavy subsoil. On lighter lands it is

of inferior quality. Baldwins and Kings develop best on lighter soils. On heavy lands, the colour of both these sorts is greatly impaired, which detracts from their appearance and saleability. Dark-coloured Baldwins minus that bright lively crimson are products of too heavy a soil. The McIntosh, one of our best popular varieties, appears to be adaptable to a wide range. At Ottawa, excellent specimens are grown on the lightest of sand, while in other parts of the province heavy clays produce equally as fine-looking specimens, which probably keep a little longer and better. Unfortunately, there is little information extant upon the soil requirements of different varieties of apples, so that a complete discussion is impossible.

PREPARATION OF THE LAND

It is imperative that the soil be in first-class condition previous to being planted to young trees. Probably the most important period in the life of an orchard is the first four or five years, when the future vigour and shape of the trees is being determined. Time and money expended in providing a sufficiency of available plant food and in establishing a good physical condition of the soil previous to planting is worth many times such efforts after the trees have struggled along indifferently for a period. It will pay to prepare the land a year ahead, by ploughing and using a hoed crop, if possible, such as corn, potatoes or roots. If the chosen site is already in good tilth, a year's delay is not necessary.

Ploughing, preferably in the fall, is the first operation in preparing the land for planting. This should be followed by a thorough working with a disk harrow, after which some sort of smoothing harrow or grubber is used to level down the field. Sometimes a planker is used to help level-off or even a roller, but in most cases disking and harrowing are all that are necessary.

PLANTING THE ORCHARD

PLANNING THE ORCHARD.—Previous to actual planting operations, it is desirable to prepare a plan of the arrangement of the trees. There are several arrangements of trees that orchardists use, four of the most important being the square method, the quincunx, the hexagonal and the alternate.

The square method, which simply consists of placing the trees so that one stands at each corner of a square or rectangular figure, is the easiest to plant, but is somewhat more wasteful of land than the hexagonal arrangement. In figure 3 the square method is shown, with the trees placed 40 x 40 feet apart. This distance is sufficient for the largest trees, and closer planting may be adopted. The better plan for a closer arrangement of the trees would be to put the permanent or standard trees at 40 x 40 and then plant temporary or filler trees between. These fillers may be placed in between each two trees in the row, which is known as filling one way, or they may also be placed in rows between two rows of standards. If placed in both positions, the trees would be 20 x 20 feet and the orchard would be said to be filled both ways. If early bearing varieties like Wealthy are used as fillers, the crop from them will be a considerable factor in the economics of the proposition before removal is necessary owing to crowding. When filled both ways the temporary rows may be removed first, and later the fillers in the standard rows removed.

The quincunx method, shown in figure 3 is very similar to the square, except that a tree is planted in the centre of each square. This makes the rows twenty feet apart, but each tree is 28.3 feet from its nearest neighbour. These trees in the centre are usually filler trees to be removed at a later date.

In the alternate system, the trees in every other row are opposite. In the case where the rows are put 40 feet apart this makes each tree $44\frac{1}{2}$ feet from its nearest neighbour.

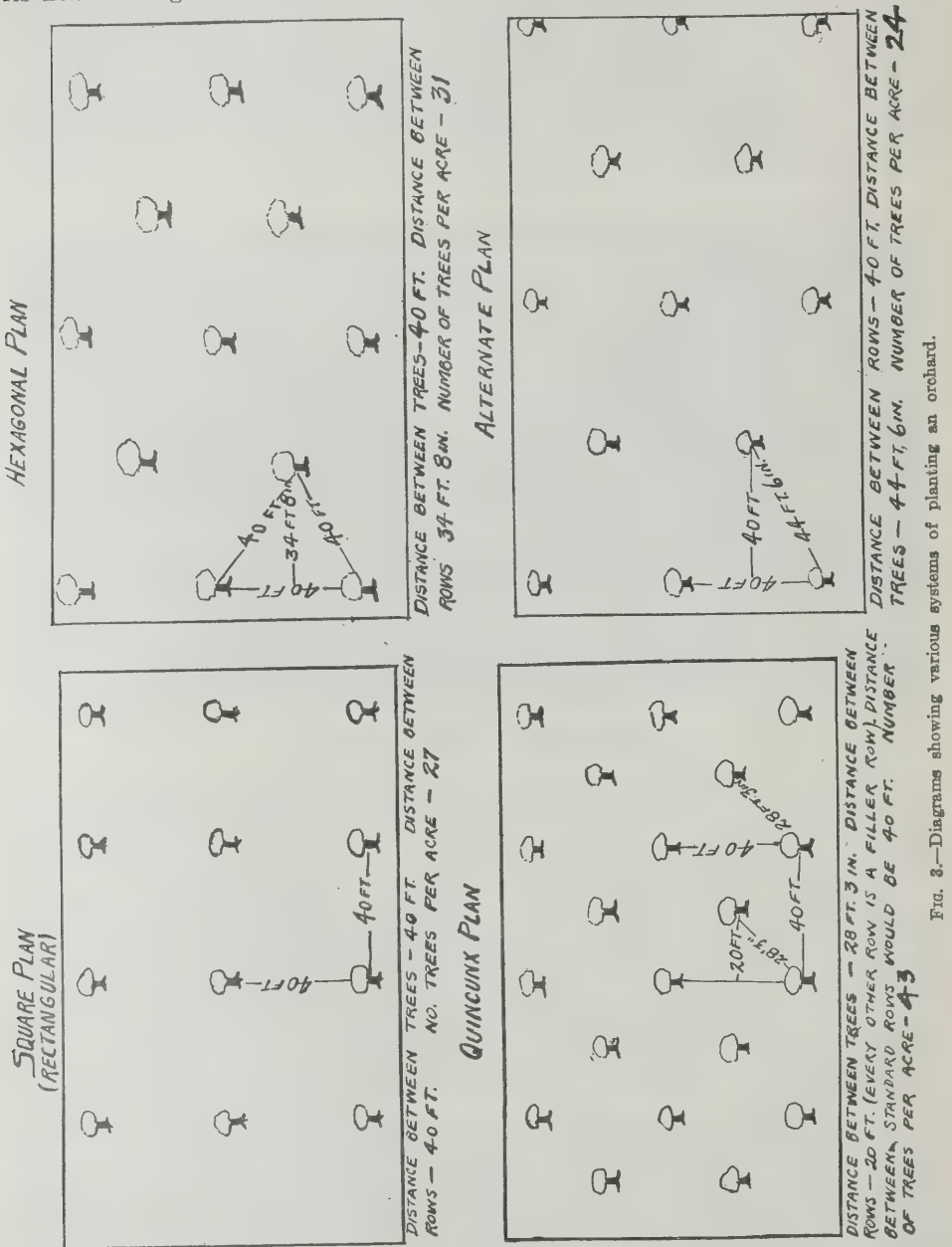


Fig. 3.—Diagrams showing various systems of planting an orchard.

The hexagonal system, which places a tree at each corner of a hexagon and one in the centre, enables the rows to be only 34.8 feet apart to get the trees 40 feet apart each way. This system permits of more trees per acre than any other system and is, where space is limited, generally adopted, while the square plan is probably the most generally used because of its simplicity.

STAKING OUT THE ORCHARD.—The proper alignment of the trees, so that after planting they will line up in all directions, is not a very difficult proposition, but one which calls for a considerable degree of accuracy on the part of those laying out the plantation. It is first necessary to lay a base line, which may parallel a fence or road. Following this, a line at right angles is established, which is most easily done by a large square, resembling a carpenter's square but much larger. This is made of two pieces of board about twelve to fourteen feet long and in the making a carpenter's square is used to get an accurate right angle. By laying this square so that one side is in line with the base line it is only necessary to place a stake at the other two corners of the square and the line at right angles will be established. By sighting, this line may be continued across the field, and the square used to turn the next corner. In this manner, a line of stakes may be run around the whole outside of the field, placing the stakes the required distance apart, using a good tape for the purpose of measuring. The centre of the square is most easily filled in by sighting both ways. A man with a stake is sighted by two other individuals, and when in line in both directions, the stake is planted. If this arrangement is carefully carried out, the whole field when planted to stakes will line up in any direction. In cases where the field is too hilly or too large to sight from one side to the other a line may be run across the centre and the two halves filled in separately.

After the planting of the stakes, it becomes necessary to use the planting board so the stakes can be removed for setting the tree. A planting board consists of a board from five to six feet in length with a notch cut out of the centre and two good-sized holes bored at either end (see fig. 4). The board is

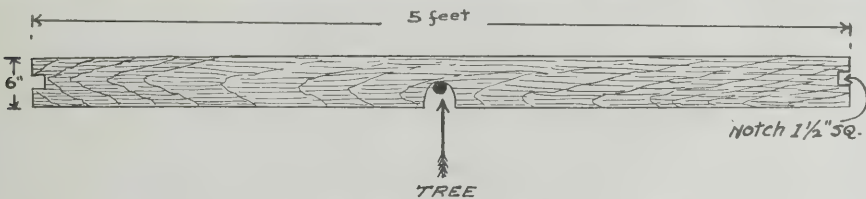


FIG. 4.—The board used in setting trees in an orchard.

set so that the notch fits around a stake and then a small peg is driven through either end and the board removed to the next stake. Where good stakes are not available it has been found that ordinary twelve-inch pot labels make excellent substitutes. When these are used, it is only necessary to saw a slot in each end of the planting board so that the board will fit over the label. In placing the board, it is better to place it so that it always lies in the same direction. The stakes, after being boarded and pegged in this manner, may be removed, and the holes for the trees dug, taking care of course not to disturb the pegs. It is then easy to place a tree exactly where the stake was by simply placing the board over the pegs and putting the tree in the notch in the centre. In this manner the whole area is planted, and the trees will line up as accurately as the stakes.

PLANTING OPERATIONS.—In digging the holes for the trees, they should be made somewhat larger than the spread of the roots of the young trees after the broken roots and unnecessarily long portions have been removed. The top soil is better laid to one side, separated from the subsoil. In planting the trees, the greatest care is necessary to see that the earth is well firmed around the roots by tramping or pounding. The surface soil is put in first and the subsoil last, thus giving the young rootlets an opportunity for gathering quickly available plant food. It is important that the young trees before planting should not be allowed to dry out. As soon as the shipment of trees arrives from the nursery,

they are best treated by heeling-in and watering well. To heel-in it is only necessary to dig a trench large enough to hold all the trees in an upright position, so that when filled in the roots will be completely covered with soil. If at all dry, the trees may be well watered at this juncture. The earth should be thoroughly firmed around the roots, and it is a good plan to locate the trench in a cool and shady spot, such as on the north side of a building or under the shade of a hedge. Handled in this manner, there is little danger of drying out if planting is delayed a few days.

Trees after being removed from the trench for transporting to the field should be protected from excessive drying. One way of accomplishing this is to fasten a hogshead to a stone-boat, in which water and trees are placed. The stone-boat bearing the trees can then go from hole to hole with the planting gang and the trees are at no time exposed to a drying wind or sun, going directly from the water-barrel to their permanent location. If unable to adopt this system, the trees should at least be protected by wet packing or moss. Some planters place the trees in the holes before starting actual setting. When this is done, one man goes ahead and drops in the trees, and another throws a few shovels of earth on the roots, which if well placed will permit of the trees being left there until permanently set.

WINDBREAKS

In exposed areas, subjected to severe wind storms, the establishment of a windbreak is of economic importance. The advantages to be derived from a windbreak are due to the lessened velocity of the wind, which may limit the following:—

- (1) Loss of moisture due to excessive evaporation brought about by a high wind.
- (2) Loss of fruit due to severe wind storms.
- (3) Injury to trees due to severe wind.
- (4) May possibly limit drying out of trees in winter, thus limiting winter injury.

A well-established windbreak undoubtedly offers much protection and lessens the velocity of the wind over a considerable area. Various tests have shown this effect of the windbreak to vary from eleven feet for every foot of height of the windbreak to twenty feet for every foot in height. In the Prairie Provinces this is of much more importance than in the east, and probably an assumption that a windbreak would offer adequate protection to a distance equal to fifteen times its height would be approximately correct. This would necessitate, where shelter is a necessity, the planting of frequent ranges or hedges of windbreaks to ensure suitable protection. (Fig. 5.)

During the drying winds of spring and summer, the loss of soil moisture due to hot winds is naturally lessened by windbreaks, and when moisture is a vital factor in fruit production, a windbreak may become of the utmost importance. Loss of fruit due to heavy winds in the fall is frequently a factor causing severe loss to the grower. Windbreaks properly planted and established can do much to eliminate this source of loss.

The breaking down of trees due to severe storms can also largely be eliminated, or at least materially reduced, by adequate windbreak protection. Just how much winter injury is due to drying out of the trees is conjectural, but it may be that there is considerable loss that may be curtailed by windbreaks.

A good variety of tree for windbreak, as recommended by Macoun for Eastern Canada, is Norway spruce (*Picea excelsa*), which can be replaced by native white spruce in Western Canada. Being an evergreen it provides more

protection in winter than deciduous trees. For shelter purposes it is planted eight to ten feet apart. In severe localities more than one row may be planted, in which case the rows may alternate, one tree in one row coming between two trees of the other. Where it is necessary to obtain some sort of shelter more quickly than the white spruce growth will provide, the *Caragana arborescens* or Siberian pea tree may be used. This can be planted in front of the spruce, about ten feet or so from it, and being a rapid grower will afford protection in a very few years. This variety may be planted at from three to four feet apart and permitted to form a hedge. Other rapid-growing trees recommended for this purpose are Lombardy poplar, cottonwood, white pine, and European larch. Manitoba maple or box elder has been largely used on the prairie, but is not a long-lived tree, is very subject to insects, and although a quite hardy, rapid grower, is not to be as highly recommended as caragana or cottonwood.



FIG. 5.

Caragana hedges as a means of protection on the Prairies. Note the Caragana hedges on the right and left. Photo taken at the Dominion Experimental Station, Morden, Man.

Protection from the north and west is usually desired, and in the greater part of Canada, is all that is required. On the prairies it often becomes necessary to entirely surround the plantation by a windbreak, and if the enclosure is of any great size, cross hedges of Caragana or some other tree are run east and west, thus establishing exceedingly well protected ranges about two hundred feet in width. Such an arrangement ensures the retention of snow and the maximum protection from high winds both in winter and summer. The accompanying illustration (Fig. 5) from the Dominion Experimental Station at Morden, Manitoba, illustrates this method as tested and employed there.

SELECTION OF NURSERY STOCK

In purchasing nursery stock, the most important consideration for those parts of the country where winter injury to roots is liable to occur is to see that the trees are on hardy roots. Unfortunately the great majority of our nurserymen propagate on French crab stock, which is too tender to withstand fully a severe winter without snow protection. The use of such stock will often be attended by partial debility or complete loss of the tree. Over a period of years a tree is no hardier than the stock on which it is grafted. Although Wealthy apple trees are considered hardy, yet when grafted on tender stocks they are often lost, due to root injury. The results of the work of the Horticultural Division at Ottawa have demonstrated that, when hardy roots are used, root-injury is comparatively rare. Imported stocks are liable to be grown from seed of varieties which are not sufficiently hardy for our northern climate and should not be used by northern propagators if it is at all possible to obtain stocks from hardier varieties. Seed from varieties of crabs like Martha, Transcendent, Hyslop and Quaker Beauty have given stocks which have withstood severe winters at Ottawa. Likewise seed from the hardiest Russian sorts has also proven of value, such varieties as Antonovka, Anisim, and Titovka being used to advantage.



FIG. 6.

Showing relative hardiness between imported stock and stock grown from hardy crabs.
The X marks the row of hardy crab stock.

In Bulletin No. 86, published by this Division, attention was called to this form of winter injury and a remedy suggested in the use of hardy stocks. After citing the example of the heavy loss in trees at the Central Experimental Farm in 1895-6, due to root-injury, the article says:—

“Another reason why we have not been troubled with root-killing during the past twenty years at Ottawa is that practically all our grafted trees have been since that time

grafted on crab apple roots, not on *Pyrus baccata*, although some are on this stock, but on the seedlings of Martha, Transcendent and other cultivated varieties. The apple seedlings used by nurserymen for stocks vary much in hardiness. Every tree probably differs more or less, and some are undoubtedly quite tender. The result is that varieties otherwise hardy, when grafted on these roots, fail. Seedlings of the crab apples are much more likely to be hardy, and we believe that if some nurseryman would make a specialty of growing the apples suitable for the colder parts of Canada on crab apple stocks he would in time sell a large number of these trees. The advantage of crab apple roots has been very marked in the Northwestern States where trees on ordinary apple stocks have been killed out, while those on crab roots were uninjured."

It would be well if growers, in parts where root-injury occurs, would heed the advice here given and demand that their trees be on crab stock, distinguishing between French crab and our hardy American sorts. The importance of this might be more fully impressed on the reader by referring to figure 6, which illustrates our most recent experience in this connection as follows.

In 1920, owing to shortage of hardy roots, the Horticultural Division imported a quantity of root-stocks grown from seed of evidently tender sorts. These were grafted during the winter of 1920-21 and planted in the spring along with a few grafts on our own stock grown from hardy crabs. During that winter, which was a severe one for root-injury, practically all, or about 95 per cent of the imported stocks were killed in the nursery rows, whereas the hardy stock showed no signs of injury. No better example than this could be found, but another case of the value of hardy root stocks might be cited. In 1915 a young orchard of McIntosh, Wealthy and Fameuse apple trees was planted on the Division grounds. These trees were all grafted on French crab stock. During the open winter of 1919-20, when much injury to bulbs and herbaceous perennials was caused on account of low temperatures without any protection from snow, over 75 per cent of these trees were killed at the root. When pruned in early spring, before growth commenced, the tops showed no signs of injury and were recorded as wintering well. The trees later started into full leaf and suddenly succumbed after the reserve food supply of the top had been entirely utilized. A nursery of the same varieties, growing close by, came through intact, but in this latter case they were all grafted on hardy apple or crab stock. As it is difficult for nurserymen and others to obtain stock from hardy varieties the Division is adopting the policy of turning all fruit from the hardiest crabs and Russian varieties through the cider mill for the purpose of extracting the seed, and intends to grow this seed for apple stocks to be sold direct to propagators at a reasonable price per thousand roots.

If all the new orchards to be planted in the districts where root-injury frequently occurs can be put on hardy stocks, much of the loss of the past can be eliminated. This question is one of vital importance to all who contemplate planting in the near future, and growers can do much to hasten the day of appreciation of this point by demanding that their purchases be on roots grown from varieties known to be hardy.

Not only does this apply to apple trees, but with even greater force to plums and pears. Frequently plums are worked on Myrobolan stock and sometimes on peach stocks. Neither of these is hardy for Eastern Ontario and Quebec and should not be used. The native plum of Canada, *Prunus nigra*, or varieties of the Americana group, are hardy, and may be used with success as stocks for severe districts. Pears worked on quince or tender pear roots are not to be recommended. For this fruit, growers should be assured that their varieties are on pear stocks, preferably seedlings of the Chinese pears, *Pyrus chinensis* (*sinensis*).

TYPE OF TREE TO PURCHASE.—This is the next point to consider, and in this connection age is a factor of importance. Many persons are inclined to

judge the quality of a tree by its size, neglecting entirely to determine the type of crotches and the kind of a head found on the tree. A one-year whip of good size, and thrifty, is preferable to an older tree. (See fig. 7.) In the well-grown one-year tree, the purchaser has an opportunity to head and shape



FIG. 7.—A well-grown one-year whip.

the form in a proper manner. It is almost impossible in the nursery to give sufficient personal attention to each tree to ensure the elimination of weak crotches and shock heads. Furthermore, only the most thrifty of the one-year stock can be sold at that age. In addition, the price is generally somewhat lower than for two- and three-year-old trees. Figure 8 shows a two-year tree with most of its branches coming at too sharp an angle, necessitating the

removal of most of the branches; so that the gain over a one-year whip is more apparent than real. Three-year trees are not generally to be recommended. If they are well grown and thrifty they are too large for the most successful transplanting; if not large, they are culls and should be avoided. One-year trees do not make as imposing an appearance when set, but in a few years' time it would be difficult to distinguish much difference in size between an orchard set at one year of age and one set at two or three years of age.

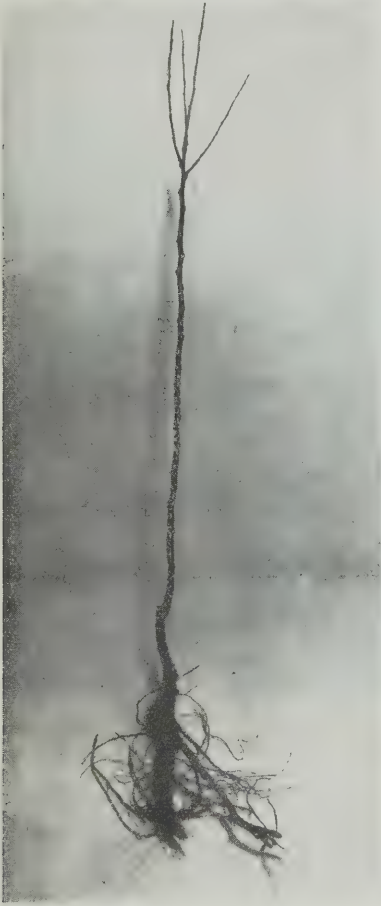


FIG. 8.

Two-year tree with branches coming at too sharp an angle.



FIG. 9.

Two-year tree with branches coming at a better angle.

HOME-GROWN VS. IMPORTED STOCK.—In past years the virtues of home-grown stock were greatly extolled. Although there are undoubtedly advantages in purchasing trees close at hand, the theory that apples propagated in a district become acclimatized has not been borne out in practice. Trees of McIntosh propagated in the south are as hardy when transported to the north as those propagated in that area, providing they are propagated on hardy root-stocks. Other things being equal, however, there is a distinct advantage in the stock close at hand, as it allows an opportunity to inspect the trees and to have any necessary replacements made.

ORCHARD MANAGEMENT

As soon as the orchard is planted, cultivation becomes necessary and should be given frequently up to about July 1. If the orchardist desires to utilize the vacant land between the rows for other crops, this can be done, but it is wise to leave a strip of land on either side of the trees which can be kept



FIG. 10.

Tractor and disk at spring work in the orchard at Macdonald College.

cultivated and used for cover-crop purposes. This brings us to the point where it is necessary to become acquainted with modern orchard management, which includes cultivation, use of cover-crops, spraying and pruning. These are all discussed in Bulletin No. 18, New Series, Dominion Department of Agriculture, which can be obtained free of charge upon application to the Publications Branch, Department of Agriculture, Ottawa, Ont.

GIRDLING BY MICE AND RABBITS

PROTECTION AGAINST RODENTS.—One of the greatest hazards in the growing of a young orchard is the danger of girdling from mice and rabbits; but this hazard can be almost, if not entirely, eliminated by the adoption of precautionary measures. The depredations of these animals varies much from year to year, depending largely upon their available supply of food. When they find food scarce, they turn to the young, succulent bark of the tree, and will chew at it until the tree is completely girdled. These girdled trees commence to grow in the spring from the supply of stored food in the top, but suddenly wilt down and die, almost without warning, when this supply is exhausted. The

orchardist then suddenly wakes to the fact that something is wrong, and upon close examination soon discovers that his trees are girdled.

Mice are more prevalent in orchards under sod than where cultivation is practised, but even cultivated orchards are not free from their depredations, so young trees should be regularly protected against their ravages. This may be accomplished in two ways: (1) by the use of building paper, and (2) by the use of wire or metal protectors. The building paper is a very cheap means of protection from the standpoint of material, but, as it lasts only the one season, is extravagant of time through the necessity of wrapping the trees each fall. Single-ply white or grey building paper is used. Tar paper may be used, but



FIG. 11.

Orchard trees protected with building paper against rodent injury.

is not recommended as there is a possibility of injury to the trees. The paper is cut into strips about six or eight inches wide and the full length of the roll, which is generally about thirty inches. The paper is wrapped fairly snugly around the trunk of the tree and tied with binder twine top and bottom. After tying, a little earth is mounded up around the base to prevent rodents working under the paper. This paper is generally removed in the spring. (Fig. 11.)

The other method, the use of wire or metal, is more permanent, more expensive in material, but cheaper in labour, for the metal protectors last for a long period of years. Fine meshed galvanized wire netting is the most lasting material. It is fastened by small pieces of wire, and is made large enough to allow for the trunk expanding as the tree grows.

Another very satisfactory and cheaper material is made from expanded metal, such as is used in building. It is better when both galvanized and dipped in paint, in which state it may be obtained from the factory. This material is fastened around the trunk by small wire fasteners as is the wire netting. It is advisable to stick the ends of these wire protectors in the soil so that there will be no danger of the mice working from underneath.

POISON BAIT.—It frequently happens where there is a heavy fall of snow that the damage from rabbits is almost uncontrollable, as they are able to girdle and chew the branches by standing on top of the snow. The building paper and wire protectors are of little avail against such depredations. Unfor-

tunately, although poisons are quite effective against mice, they seem to be of doubtful value in controlling rabbits. The following poisons have, however, been recommended and used with varying degrees of success against both mice and rabbits:—

White arsenic—1 part.
Corn meal—3 parts.

Mix thoroughly and spread around the area to be protected.



FIG. 12.

Scions used in bridge-grafting properly cut and shaped.

Another formula recommended by the United States Department of Agriculture is:—

Powdered strychnine— $\frac{1}{8}$ ounce.
Baking soda— $\frac{1}{8}$ ounce.

Mix dry, sift the mixture over one quart of rolled oats, stirring constantly. Heat this poisoned mixture until warm. Mix 3 quarts melted beef fat with one quart melted paraffin and sprinkle six tablespoonfuls of this mixture over the poisoned oats and stir. Place small quantities of this in small containers over the infested area.

REPELLANT WASHES.—The following repellent wash was recommended by the United States Department of Agriculture and given by Macoun in his bulletin, "The Apple in Canada":—

Unslaked lime—20 pounds.

Flowers of sulphur—15 pounds.

Water—40 gallons.

This is applied to the trunks of the trees with a brush.

TREATMENT OF INJURED TREES.—Trees that are badly girdled by mice usually die or are, at least, very much reduced in vigour. If completely girdled, death is certain. If the girdle is only partial, it may be cleaned out and covered



FIG. 13

Scions inserted under the bark and ready for binding and waxing.

with grafting wax or melted paraffin to exclude air. Treated thus, partial girdles will heal over. When the girdle is extremely bad or complete, bridge-grafting may be adopted as a means of saving the tree. Of course if the tree is very young it might be better to cut it off at the ground and graft a scion into the old root. This is described under the section on grafting.

BRIDGE-GRAFTING.—Clean the wound and trim the bark top and bottom to straight edges with a sharp knife. Next cut some well-matured scions of one-year wood, cutting them a little longer than the length of the wound. Shape these scions like wedges at both ends (see fig. 12). Next, slightly lift the bark at both the upper and lower parts of the wound. This is facilitated by cutting slashes in the bark at right angles to the diameter of the tree, so that instead



FIG. 14.
The bridge completed.

of trying to raise the whole body of bark only strips are raised. Insert one end of the scions under the top layer of bark, continue until there are enough scions under to practically fill the gap. (Fig. 13.) Generally about four or five scions to a tree four inches in diameter is sufficient. Bind these scions at the top tightly to the bark by a piece of thin cotton or twine, then smear over with grafting wax and bind more firmly with a stouter bandage. Place a small piece of wood under the scions at about the centre so as to cause a hump when the lower end is bent closely to the tree. This helps to keep them wedged tightly. Then cut

the slit in the bark at the lower portion of the wound, insert the other end of the scion, bind tightly, wax and bind again as described above. The block of wood used as a wedge may then be removed and the whole covered with a grafting wax and, if desired, bound not too tightly with any clean piece of bagging or old cotton. (Fig. 14.)

Another method frequently adopted is to cut wedge-shaped channels in the bark at the top and bottom of the wound. Then insert one end of the wedge-shaped scion, shoving it tightly into the channel. Bind and wedge as described in the first method and do the same with the other end. The rest of the procedure is exactly the same as described above. Sometimes the scions are held in the channels by small brads or tacks.

It is better not to perform this bridge-grafting too early. Generally the best time is just after the first flush of sap has taken place. The scions to be used, however, should be dormant and should be cut in that condition and held if necessary in a cold place, such as a refrigerator or in an ice-house until required for use.

TOP-WORKING-OVER OLD TREES

The top-working-over of old trees, or top-grafting, is sometimes desirable and can be performed by any person with a little care, who has a knowledge of the method. The following on the selection of scions and top-grafting is taken from Macoun's bulletin, "The Apple in Canada":—

SCIONS.—"As much of the success in grafting depends on the condition and quality of the scions, too much stress cannot be laid on the importance of having them of the best quality, and in the best condition at the time of grafting.

"Scions may be cut any time after the wood is well ripened in the autumn, and before the buds begin to swell in the spring. The best time, however, is in the autumn, as they may then be kept in the condition desired, although scions which are not kept in good condition all winter are not as good as those cut from the tree early in spring and grafted at once.

"If they are cut in cold weather, in winter, there is less sap in the scions at the time and thus the chance of their drying up is greater than if they were cut in the autumn. One cannot tell very well either, in winter, whether the young wood has been injured or not. Scions should be cut from healthy, bearing trees. The wood of old trees is liable to be diseased, and if diseased wood is used, it is likely to produce a diseased tree when grafted. Scions should also be cut from the most productive trees. Occasionally one or more trees of a variety will produce more and heavier crops than the others. If scions are taken from these trees, the probability is that a larger proportion of the grafted trees will produce crops like the trees from which the scions were taken than would otherwise be the case, although this is not satisfactorily proven yet. It is, however, true that scions from a tree with especially highly coloured fruit of a variety will, if taken from certain trees of the variety, produce highly coloured fruit. The scions should be cut from the wood of the current season's growth, as older wood is not satisfactory. The buds should be well developed and the wood thoroughly ripened. It is not wise to use the water sprouts or young shoots which spring from the main branches or trunk for this purpose. They may not be thoroughly ripened, and it is also possible that sprouting propensities may be thus more developed in the grafted trees. The entire season's growth may be cut off and packed away until required for grafting, when it should be cut into pieces from four to six inches in length, each having three well-developed buds.

"Scions may be kept in good condition in moss, sawdust, sand, or forest leaves. The last two named are found very satisfactory at Ottawa. These materials should be slightly moist, but not wet; the object being to keep the

scions fresh and plump without there being any danger of rotting. They should be kept in a cool cellar which is not too dry, and should remain dormant until ready for use."

TOP-GRAFTING.—"When there are trees which produce poor or unprofitable fruit, they may be made to bear good fruit by top-grafting other varieties upon them. If it is desired to grow a variety which, when grown in the ordinary way, proves a failure, on account of root-killing or sunscalding, it is possible to grow it successfully by top-grafting. Varieties which ordinarily take a long time to come into bearing will fruit much sooner when top-grafted. These are some of the most important results which may be obtained by this operation.

"Up to the present time in Canada, top-grafting has usually been done on old or bearing trees which produced poor fruit, and as very satisfactory results have been obtained, this practice will continue to be popular.

"The work is done in the spring before growth begins, but it is possible to graft successfully even when the trees are coming into leaf, provided the scion is quite dormant; but the chances of success are much lessened if it is done late. As the shock to a large tree would be very great if all or nearly all of the branches on which the leaves develop were cut off the first season, from three to four years should be devoted to removing the top of the trees. If, however, a large number of scions are inserted, the top may be changed in less

time, but, as a rule, it is not wise to do it in less than three years. Furthermore, a too severe pruning at one time will cause a large number of shoots to grow on the tree, and considerable labour will be involved in removing them if many trees are grafted. Cleft-grafting is usually adopted in top-working trees, it being a simple and satisfactory method.

"The branches to be grafted should not exceed an inch and a half or two inches in diameter. If they are larger, it is so long before the stub heals over that disease may set in. It is possible, however, to graft larger branches by putting in more scions. The top-grafting of a large tree should be done with a view to having the new top as symmetrical as possible, and great care should be taken in selecting the branches to be grafted upon. After the branch is sawn off, it is cleft by means of a mallet and strong knife to a depth of an inch and a half to two inches. It is held open to receive the scion by driving a wedge into it. Scions for use in top-grafting are cut from dormant wood, which has been kept in good condition in the manner already described, or from wood taken from the tree before the buds swell in the spring. They should have about three strong buds and should be cut wedge-shaped at the base, one side of the wedge being a little thicker than the other. Two scions are now inserted in the cleft of the stub, with the wide side of the wedge on the outside, and thrust down until the lowest bud is almost on a line with the edge of the stub. The inner bark of both scions and stub should meet at some point, so that the union will take place readily, and this is more easily effected if the scion is given a slightly outward slope when inserted. When the wedge



FIG. 15.—Example of cleft-grafting.

has been withdrawn from the cleft the advantage of having the wedge-shaped end of the scion thicker on one side will be apparent as it will hold much more tightly than if both sides were the same. If the scion is not a tight fit all along, there is something wrong in the way it has been cut or the stub cleft. The cut parts should be covered with grafting wax to exclude the air and hold the scion in place. Cotton is also sometimes wrapped around the wax in order more effectively to hold the scion in place. If both of the scions grafted on the stub should grow, the weaker one should be removed after the other is well united and the surface of the stub at least partially healed over.

"It is often desirable to top-graft young trees, and this may readily be done. The main branches are cut back to within a short distance of the trunk and the scions grafted on, either by cleft- or whip-grafting. The closer the grafted part is to the trunk the better, as the tree will be stronger than if union occurred further out on the limb, since the growth of graft and scion may not be equal. It is well, however, to have one bud left on the stub so that in case the grafting is not successful a new shoot can readily start. Otherwise the stub may die back to the trunk. It is possible to cut off the whole top of the tree and graft successfully on the main trunk, when the tree is young, but unless one is sure that the union will be perfect and the top not outgrow the stock, it is better not to run the risk of losing the tree. Furthermore, if the whole top is cut off there will be such a growth the first season that the scions are liable to be broken off. In top-grafting a young tree that has been planted from three to five years, it is better to take two seasons to do the work, as the result will, as a rule, be more satisfactory. The central or leading branches should be grafted the first year for should the side or lower branches be grafted first, there may be too much growth in the ungrafted parts for the grafts to do well.

"It is necessary to examine the grafted trees during the summer and remove any young shoots from the stocks which are interfering with the scions. It is not wise, however, especially when the tree has been cut back severely for grafting, to remove all the shoots until the grafts have grown considerably and furnish a good leaf surface."

DOES IT PAY TO TOP-WORK?—This entirely depends upon conditions. In some orchards which contain a large number of varieties it may pay to top-work over to a few varieties. In such orchards, picking is often very expensive, especially where trees of a variety are badly scattered. Under such conditions, which necessitate much travelling with picking equipment to all parts of the orchard to pick a single variety, it would probably pay to top-work, but if the varieties are in solid rows, it is doubtful if top-working would pay in the long run, unless on fairly young trees.

As there is considerable expense attached in time as well as a loss of some years in bearing, it is very doubtful if top-working of poor varieties to better varieties really pays on old trees. Under such conditions it might be better to either plant out a new orchard or inter-plant with young trees and gradually head back the older ones as the young ones need the room, with the eventual elimination of the old trees.

THE POLLINATION QUESTION AS IT AFFECTS YIELD

A very large number of our commercial varieties of apples are self-sterile, that is, are not able to set fruit when pollinated with their own pollen. Other varieties are partially self-fertile and a few are considered to be fully self-fertile. As the self-fertility of a variety appears to vary with different districts it is impossible to state definitely whether a certain variety will be self-fertile or self-sterile under certain conditions. Furthermore, experimental evidence

goes to show that the majority of varieties, if not all, set better crops when cross-fertilization takes place than when they are dependent entirely upon their own pollen supply.

From the standpoint of the orchardist all varieties of apples should be considered as practically self-sterile and reliance should not be placed upon planting large areas of a single variety. Large blocks of a single variety frequently fail to produce a full crop under the best of management, and much, if not all, of this failure can be traced to lack of proper pollination. Occasionally large blocks of one sort give good results, but the conditions are exceptional, such as being surrounded by other varieties, or having in the vicinity large numbers of bees and other insects which carry pollen for long distances.

In general, the best advice that can be given is to plant, at the most, several rows of one variety and follow with several rows of some other sort, preferably one known to be a good pollenizer. This raises the question of what varieties are good pollenizers. Unfortunately not a great deal of work has been done to determine which are the best varieties as pollenizers, but enough has been accomplished to demonstrate a wide difference in the value of different sorts for this purpose. At the Central Experimental Farm, Ottawa, Wealthy has been found to be of outstanding merit as a pollen producer and also a fertilizer for most sorts. McIntosh Red is also an excellent pollenizer. On the other hand our work has so far shown Fameuse to be a poor producer of pollen and not outstanding as a pollenizer, although fair. Duchess is about the same. Gourley of Ohio states that Baldwin has proved practically useless as a pollenizer, so could not be depended upon to supply pollen to other varieties.

BEES AS POLLEN CARRIERS.—It is necessary that pollen be transported by some agency from the variety producing it to the ones to be pollinated. In this connection experiments have, so far, failed to demonstrate that wind is a reliable agency, so that other means for the transport of pollen must be sought. In the work of this Station the wild bee has been shown to be a good pollen carrier and the honey bee has been shown as an important factor in this work. The value of the honey bee has also been very fully proved by Alderman in Virginia, so there can be little doubt that every orchardist should encourage the production of the honey bee in his orchard. Although the honey bee is known to work for miles from its hive it is not sufficient that an apiary be close at hand, as it has been noticed that frequently bees from a certain apiary will only work in certain directions, so that it becomes almost necessary to have a few hives scattered throughout the whole orchard area to ensure a proper pollination of all the trees.

PICKING AND PACKING

Upon the careful and judicious handling of the fruit from the time it is ready to pick until the time that it reaches the consumer, depends much of the success of the fruit grower.

The time at which to pick a variety is one difficult to describe and must depend to a large extent upon personal experience. In the case of summer varieties, which are generally sold on a local market, the fruit may be left on the trees until practically ready to eat, picked carefully, and sold immediately. For the handling of fruit destined for this early local market trade the Central Experimental Farm has found the six- and eleven-quart baskets to be the most popular and economical package to use. Not only does it lend itself to quick handling and packing, as well as being fairly cheap, but it constitutes a very convenient package for the consumer who, even though he may have ample storage space, does not desire any large quantity of early fruit at one time. The entire crop of the Horticultural Division is disposed of in this manner, the

eleven-quart basket being more popular than the six-quart size. It has been found that this meets the requirements of the apartment-house dweller better than any other package yet found. For local use, this package is strongly recommended as a means of increasing the consumption of fruit. Without some such sized package the consumer is obliged to purchase either by the bushel, barrel or by the pound or gallon. The two former are generally too large and the latter is an inconvenient package to carry.

In picking for export, the really early varieties are not generally considered, but if they are, picking must be somewhat on the green side, before the fruit has begun to mellow. In the case of winter varieties, whether for home use or export, picking is always done before the variety is ready for consumption. If the picking is made before the fruit has reached a certain stage of maturity the product does not keep properly and is very liable to scald in storage or transit. On the other hand if left on the tree too long, or until it becomes too mature, it is subject to various disabilities, such as the breaking down of the internal flesh caused by hastening maturity. Frequently, in order to obtain a much higher colour on winter varieties, they are left on the tree too long and as a result do not do as well. A practical example of this is the case of the Jonathan break-down, investigated by the Horticultural Division of the Central Experimental Farm, which found that the over-matured fruit gave the greatest percentage of break-down. Fruit picked a week or two earlier than the customary practice was almost free of the trouble, demonstrating the care which must be exercised in picking at the proper time.

Aside from the necessity of exercising good judgment with regard to proper picking dates, care must be practised in the handling of the crop; particularly in some of the eastern fruit areas is a word of caution pertinent. In picking, the fruit should not be thrown into the baskets, but placed in carefully. A basket with a swing-bale should be used, which permits of emptying into a barrel by lowering the basket to the bottom and turning it over gently. Fruit should never be poured into the barrel, as is not uncommon in some districts. It is advisable to rack the barrels in the field, especially if they must be hauled any distance. If not racked, the fruit gets bruised due to the slackness of the barrel and much fruit is often injured in this way. Racking is accomplished by placing the barrel on a narrow board and rocking it back and forth to settle the apples in the barrel. In the orchard two or three rackings during the process of filling is sufficient, after which the barrel is headed and laid on its side. If in the late fall, when the weather is cool, the barrels may be left for a day or so in the orchard and probably will cool off as much there as in any place, but if the weather is warm it is advisable to just leave them in the open overnight and haul to the storage warehouse in the early morning before the heat of day.

Some growers prefer to pack in the orchard and during fine weather. Especially for varieties that are to be shipped immediately this practice has much to commend it. The fruit is not handled as many times and has less chance of being bruised. If packing is done in the orchard for the early varieties it becomes necessary to erect a packing table, which should be well padded with soft material. The fruit may then be emptied carefully on to the table and the graded fruit placed in the barrels to be shipped. Anyone interested in packing is referred to the Dominion Fruit Commissioner, Ottawa, Ont., whose department handles the packing and grading of apples and administers the Fruit Marks Act.

STORING

From Bulletin No. 86 by Macoun

"If the fruit is not disposed of at once, it should as soon as it is picked or packed, be put where the temperature will be controlled and the fruit kept cool. Every fruit grower who has a large orchard should have a proper place for storing his fruit. It often happens that, at the time of picking, the prices for apples are very low. If a grower has not a proper place to store them, he is obliged to sell, while if he were able to hold them for a while better prices would be obtained.

"A cellar often answers the purpose of a storeroom, but it takes a large cellar to store fruit from a large orchard. For most varieties of apples a well-ventilated room above ground with comparatively dry air, the temperature of which may be kept low, is the best. Apples such as Russets which shrivel easily keep better in a moist atmosphere. A fruit building may be erected without a great expenditure of money. It should be built in such a manner that the warm air may be kept out and the cooler air kept in, or vice versa. The temperature should be kept as cool as possible in the autumn, and in the winter it should be maintained at from 32° F. to 35° F. The cooler apples are kept without freezing the better.

"Apples may be kept in such a building until they are required for shipment. If they are kept late into the winter, they should be repacked before shipping, to avoid sending away anything that will be a discredit to the grower and a loss to the consumer.

"In houses in cities it is often difficult to get a place where the temperature may be regulated, as it is usually either too warm or too cold. However, the coolest place should be chosen where there is no danger of frost. If there is a choice of two rooms, that with the moister atmosphere would be the better, for, as a rule, the air is too dry for keeping apples properly in a city house. If the apples are in good condition and none of the specimens show signs of rotting, they may be left in a barrel or box. If, however, they show signs of rotting, they should be sorted and the perfect specimens wrapped in paper. If the room is very dry, it will be better to put them back in the barrel or box, after wrapping as they will shrivel less when put in a mass where the air will not get at them so easily. Tissue paper or pieces of newspaper may be used for wrapping. Moreover, there will be much less danger of rot spreading if the fruit is wrapped. It is important to keep the fruit in clean receptacles, otherwise they may absorb unpleasant flavours.

"The increased shipment of early and tender fruits to Great Britain and to the western provinces of Canada has made the need of cold storage buildings felt and many have been erected in recent years. The temperature in such buildings is kept down by means of ice or by some artificial method, as the ordinary storeroom could not be kept cool enough in the heat of summer. To ship early apples successfully to Great Britain and the Prairie Provinces of Canada it is necessary to pick them well coloured but before they have begun to soften, and keep them constantly cool in a pre-cooling chamber of the cold storage house or refrigerator car."

Further information in regard to pre-cooling and cold storage can be obtained from the Dairy and Cold Storage Commissioner, Department of Agriculture, Ottawa, Ont.

FRUITING AGE OF SOME WELL-KNOWN VARIETIES OF APPLES

In the following table will be found a list of some well-known varieties of apples, which have fruited at Ottawa, arranged in the order of their coming into bearing. The age of first bearing is important when varieties are to be used as fillers, and this table aims to present this data for the varieties recommended for eastern Ontario and Quebec.

MEAN AGE AFTER PLANTING OF COMING INTO BEARING OF SOME VARIETIES OF APPLES, ARRANGED IN ORDER OF MERIT

Variety	Mean age of first bearing	Mode	Range	Remarks
	years	years	years	
Wealthy.....	3.9	4	2- 6	
Milwaukee.....	4.3	4	1- 7	
Dudley.....	4.5	5	4-10	
McIntosh.....	5.5	6	3- 8	
McMahan White.....	5.7	7	3-10	
Peach of Montreal.....	6.0	6	- -	Only one tree reported
Yellow Transparent.....	6.0	6	- -	
Duchess.....	6.1	4	4-10	
Fameuse.....	6.2	6	6- 7	
Charlamoff.....	6.9	6	3-14	
Bethel.....	7.6	8	6- 9	
Lowland Raspberry.....	8.1	9	6-10	
Baxter.....	10.0	10	- -	Only one tree
Hibernal.....	10.0	5	5-20	

EXPLANATION OF TERMS—*Mode*: The mode is the class which contains the largest number of individuals. In this instance, using Wealthy for example, there were more Wealthy trees which bore at four years than at any other age.

Mean: The mean is the same as the average.

Range: The range is simply a statement of the extreme limits; the youngest age on one hand and the greatest on the other.

In the table, the mode is given as well as the mean and also the range. As the mode is the largest class it is quite as significant as the mean. For instance, in the case of Hibernal the mean or average age of coming into bearing is ten years, but the greatest number of trees bore at five years after planting. The average was brought up by a few trees taking from eight to twenty years to bear. A grower planting this variety, therefore, could be assured that the great majority of his trees would come into bearing at five years after planting. In most cases, however, it will be noted that the mean and the mode are very close together. From the table it will be seen that Wealthy is outstanding as an early bearer, with Milwaukee and Dudley as two desirable sorts in this respect. Duchess, although it has a rather high average, had the most of its trees come into bearing four years after planting, so can also be considered as an early bearer.

NURSERY PRACTICE

(From Macoun's Bulletin No. 86)

ROOT-GRAFTING.—"The cheapest and one of the best methods of propagating apples, especially in Canada, is by root-grafting. The strongest of the young stocks which have been grown in the manner already described are heeled in during the autumn, but grafting is usually not started until January or February. (Fig. 16.)

"At Ottawa the best success has been obtained when grafting was done early in February. By grafting early, the wound has time to callous well

before the grafts are planted out, which is important. Whip- or tongue-grafting is the method usually employed. As only the root is required, the trunk and branches are cut off and thrown away. As there is but little advantage in using the whole root, it may be divided into several pieces, much depending



FIG. 16.—Example of root-grafting.

on its size. Each piece should be at least four inches long. A smooth, sloping upward cut, about two inches long, is made across the main part of the root most suited to receive the scion. The scion is prepared by cutting off a piece of the wood procured for the purpose in the autumn from four to six inches long and with about three well-developed buds on it; a smooth, sloping cut downward and across it is now made of about the same length as that already made on the stock. Clefts are now made in the sloping surface of both scion and stock, in the former upward and in the latter downward. They are then joined together by forcing the tongue of the scion into the cleft of the stock. The inner bark or cambium of both scion and stock should be in contact

with one another on at least one side of the graft, as it is at this point of contact where the union begins to take place. In order to ensure a speedy and successful union, waxed cotton thread is wound tightly around to hold the parts together. Amateurs are also advised to rub grafting wax all over where the two parts are joined, as with this treatment success is likely to be more certain.

"The operation having been completed, the grafts are packed away in moss or sawdust until spring. They are then planted out in nursery rows about three feet apart and one foot apart in the rows, the point of union being about three inches below the surface of the soil. The ground should then be kept thoroughly cultivated throughout the season. Some varieties of apples throw out roots quite readily from the scion and after a time they thus come to be practically on their own roots. If it is desired to have a variety on its own roots, a scion from eight to twelve inches long may be used, and the graft planted deep in the nursery row, only leaving one bud of the scion above the surface of the ground. Roots will then be thrown out on the scion, and when the tree is dug the stock may be cut away and the tree will then be on its own roots. Or, on the other hand, a piece of root from a tree of the same variety as the scion may be used as the stock."

CROWN-GRAFTING.—"Crown-grafting is usually done on young stocks in the nursery row in the spring. The trees are cut at or just beneath the surface of the soil at the crown or collar. A sloping cleft is then made in the side of the crown, and a scion cut wedge-shaped at the lower end is inserted in the cleft. The same precautions should be observed as in root-grafting, of having the inner bark of both stock and scion touching on at least one side. The grafted part should then be well covered with grafting wax, in order to exclude the air. The trees usually make a strong growth when grafted in this way, but as the work has to be done in April before growth begins it is often inconvenient to do it at that busy season of the year."

BUDDING.—"Although grafting is a common method of propagating apples, budding is very popular among nurserymen. The latter has some advantages over the former and can also be done at a time when grafting could not be performed successfully. (Fig. 17.)

"The best season for budding the apple is in late summer, some time during August being the most suitable time in most places in Canada. Young stocks of the first or second season's growth from seed are generally used. The process of budding adopted for apples consists of inserting a bud, with very little or no wood, under the bark of the stock and on the surface of its wood. It is called shield-budding.

"Budding is best performed when there is still sufficient sap beneath the bark to permit of the latter being easily raised with a knife. On the other hand, if the work is done when the tree is still growing vigorously, the bud is liable to be 'drowned out,' or, in other words, forced out by reason of too much sap and growth of the stock.

"The stock which is to receive the bud should be at least three-eighths

of an inch in diameter near the ground. The lower leaves are rubbed off to a height of five or six inches to enable the budder to work more freely. A perpendicular cut is now made in the stock as near the ground as possible from an inch to an inch and a half long and preferably on the north side of the tree, as the bud will not be so readily dried out by the sun on that side. The cut should only extend through the bark. Another cut should now be made across the top of the perpendicular one. The two cuts when made will appear thus: T.

"The buds are cut from well-developed or nearly mature shoots of the current season's growth of the variety it is desired to propagate. Before the buds are removed, the leaves should be cut off the shoots; a piece of the petiole or leaf stem is left, however, by which the bud may be handled after it has been removed. A very sharp, thin-bladed knife is necessary in removing the bud. Knives are specially made for this purpose. The bud is cut from the shoot downward or upward, whichever is most convenient; the general practice, however, is to cut upward. The length of the piece removed with the bud should be about one inch long, and the cut surface smooth. It should be quite thin, as but little of the wood is taken with the bud. The buds or twigs should be kept where they will not dry out while the work of budding is going on. The bud is inserted under the bark by raising the latter with the blade of the budding knife or the part of the knife handle made for that purpose. The bud is then pushed down and under the bark with the fingers, and finally the piece of leaf stalk which was left when it was removed from the twig is pressed with the blade of the knife to bring the bud into the proper position. The bark on each side of the bud, which should now be under the bark of the stock, will hold it in position. In order to bring the bud and stock into close contact and prevent the former from drying up before the union takes place, they should be tied together with raffia or some soft string, taking care not to cover the bud with it. The bud should unite with the stock in two or three weeks, and after that time the string should be cut, as otherwise the bud may be injured. If the



FIG. 17.—Example of shield-budding.

proper season has been chosen for the work, the bud should remain dormant until spring. If it starts in the autumn it may be killed during the winter. In the following spring the stock should be cut off just above the bud, which will cause all the strength of the stock to be directed into the bud and produce rapid growth, four feet and more not being an exceptional growth for the first season.

"Budding is now a very popular method of propagating apples. The first season's growth is greater than from root-grafted trees and there is a larger proportion of straight-trunked trees by this method. If it is desired also to prevent trees from growing on their own roots, budding is preferable, as trees propagated in this way may be planted so that the stock is just at the surface of the soil and all roots are thrown from it."

APPLIANCES USED IN PRUNING AND GRAFTING.—"While grafting implements and appliances are numerous, the work can be done with a few, and as it is not often convenient for the farmer or fruit grower to get a large outfit, only the really necessary things are here mentioned.

"1. A sharp, fine-toothed handsaw, to be used for sawing off large limbs, or for making the stubs on trees to be top-grafted. Unless in the hands of a

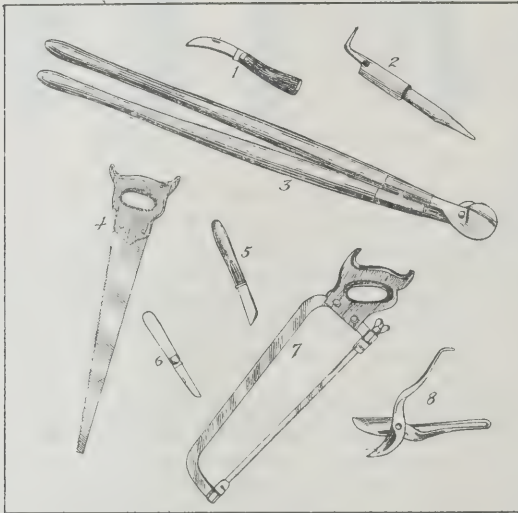


FIG. 18.

Tools used in propagating and pruning. 1, Pruning knife; 2, wedge; 3 pruning shears; 4, saw; 5, grafting knife; 6, budding knife; 7, saw; 8 pruning shears.

careful man, a saw with one edge is better than one with two, as the upper cutting edge is liable to tear the wood above.

"2. A strong pruning knife for cutting the smaller limbs, for smoothing the wounds made by the saw or pruning shears, for trimming off torn edges of branches, and for pruning roots of young trees when planting.

"3. A budding knife, with a thin steel blade, for removing buds, having an ivory or bone handle which is made thin at the end and is used for raising the bark.

"4. A grafting knife, which is used in top-grafting trees. Home-made grafting knives can be easily made. A strong, sharp blade is the chief requisite.

"5. Pruning shears, which are intermediate in their uses between the saw and the pruning

knife. They are used for cutting off branches which are too large for the latter and too small to need a saw; for rough pruning and for cutting scions.

"6. A wedge and mallet are also necessary in top-grafting trees.

"7. Raffia, which is one of the best tying materials, is very strong and pliable, and is particularly useful for bandaging when budding.

"8. Cotton yarn, which is used for tying root-grafts and is one of the most satisfactory materials for the purpose. The size known as No. 18 knitting cotton is the best. It is bought in balls, which should be soaked for a few minutes in melted grafting wax before using. The yarn may also be drawn through melted wax, which ensures it all being thoroughly soaked, and is, perhaps, on this account preferable to soaking the ball.

"9. There are many kinds of grafting wax recommended, but it is unnecessary to enumerate them all. One of the cheapest and best is made as follows:

Resin, 4 parts by weight; beeswax, 2 parts; tallow, 1 part. Melt together and pour into a pail of cold water. Then grease the hands and pull the wax until it is nearly white. One of the best waxes for either indoor or outdoor use. This should be heated before using if too hard.

"Another and more pliable wax for outdoor use is made in the following proportions: resin, 5 parts by weight; beeswax, 1 part; boiled linseed oil, $1\frac{1}{4}$ parts.

"The principal value of grafting wax is to exclude air from the wound, and thus prevent the wood from drying before a union takes place. A good grafting wax should not crack when on the tree, else the air will reach the wound and the wax prove of little value. Many materials may be used instead of grafting wax for this purpose, one of the simplest being a mixture of clay and cow dung, but grafting wax is much to be preferred. Strips of cotton are often used, especially in top-grafting and crown-grafting, for wrapping around the wound after the wax has been applied, for the purpose of helping to exclude the air, and also to assist in holding the scion in position until the union takes place. This cotton is unnecessary if good grafting wax is used; but if a very valuable variety is grafted it is safer to use the cotton, as when the growth of the scion is rapid there is a chance of it being broken off during the first season before it is thoroughly united with the stock. Large wounds on trees should be covered with some material that will protect the cut surface from the weather, prevent disease from setting in, and which will not peel off easily. A good dressing of white lead is probably the best material to use for this purpose. Grafting wax may be used on smaller branches."

THE NURSERY.—"Although, as a rule, it will be the most convenient plan to buy trees from the professional nurseryman, yet he who propagates apple trees by root-grafting, crown-grafting, or budding, for his own use, should have a nursery in which to grow them until they are ready for the orchard. A good sandy loam soil, which does not bake and is well drained, is best suited for this purpose, and will grow the strong, healthy trees that are desired. The ground should be thoroughly prepared, and the young trees planted about 12 inches apart, in rows from $2\frac{1}{2}$ to 3 feet apart. Cultivation should be thorough up to about the middle of July, when it should cease, as in colder climates especially. It is very desirable that the wood ripen well, and late cultivation would encourage late growth. It will be necessary the first year the grafted or budded trees are growing in the nursery to go over them carefully and cut out any shoots which may be coming from the stock, and also to reduce the graft to one stem should more develop. If any side branches grow, however, they should be left intact. In small nurseries it is sometimes advisable to tie the young trees to stakes the first season. This will make them straighter and will help to keep them from being broken. These trees may be planted in the orchard the following spring if one-year-old trees are to be used. During the second year, any shoots from the stocks or side shoots from the graft near the ground should be removed but the fewer branches that are removed the stockier the tree will be and it can be pruned up to the desired height when planted out. By the end of the second year or the beginning of the third, after the branches have been pruned to the proper height and the tops shaped, the trees will be in the best condition for planting in the orchard.

"In nurseries in the colder districts, the wood of yearling and sometimes two-year-old trees will kill-back in winter. Unless injured wood is cut back to healthy wood in the spring, the trees are liable to remain black-hearted, although if this condition only happens once it may not seriously injure the trees. The practice with the best nurserymen in the north is to cut yearling trees back close to the ground in spring, thus ensuring a healthy trunk and a strong growth for that season."

WINTER INJURY

Reference was made, when discussing stocks, to the winter-injury problem as it affects roots; and in a discussion of varieties, the comparative hardiness of the different sorts has been considered.

As was pointed out, by the use of hardy stocks, root-injury can be reduced to a negligible quantity, but hardiness of the top is a varietal characteristic not controlled by the root, according to experiments conducted by the Horticultural Division.

Aside from the selection of hardy varieties, one can do much to prevent unnecessary loss. During the severe test winter of 1917-18, results from the orchard at the Central Experimental Farm demonstrated the value of site selection as a means of controlling winter injury. This was referred to under the heading, "Selection of the Site." Another preventable cause observed was the devitalization of the tree due to overbearing. Among Wealthy, which is one of the hardiest varieties, the trees which bore heavily in 1917 were almost invariably the ones which suffered severely, and the ones which produced no crop or medium crops came through with comparatively little injury. This opens up the question of thinning as a means of preventing overloading and consequent devitalization, with accompanying danger from severe winters.

Cultivation and fertilizer practices may also influence winter injury. Trees which do not ripen their wood thoroughly or which are kept growing late by continued cultivation are more subject to winter injury than those which are encouraged to cease growth earlier. Cultivation should, therefore, be discontinued in late June or early July, depending upon the district, and a cover crop planted to utilize the excessive moisture and plant food of the fall also acts as a check on late growth.

Fertilizer practice may also influence winter injury; late applications of nitrogen or large applications of a slowly available supply of nitrogen both have a tendency to encourage late growth, and should be avoided.

To summarize, the following orchard practices may bear a profound influence on winter injury of root and top:—

1. Selection of proper root-stocks.
2. Selection of hardy varieties.
3. Thinning to prevent overloading.
4. Discontinuance of cultivation sufficiently early.
5. Proper selection of sources of nitrogen and care in time and quantity of application.

DWARF APPLES

We are frequently asked, "Would you recommend me to try dwarf apple trees?" To answer this question intelligently one must know whether the intending planter is referring to a commercial or home orchard proposition.

For the commercial orchardist, the answer would be no. Standard trees produce profitable crops in Canada, and the dwarf tree could not compete in the matter of production. The dwarf may, however, have a place with the amateur gardener, who desires to grow apples on a small area. Being propagated as they are on Paradise roots they come into bearing at an early age and do not grow to a very great size. These dwarf trees lend themselves to garden training, such as is adopted in the Old Country, as for instance, single cordons, double cordons, bush forms and so forth. There are two stocks used for dwarfing effects, Doucin and Paradise. The Doucin is not as dwarfed as Paradise, and it is the latter which is recommended for the amateur.

MONTHLY EXPENSE SHEET FOR RECORDING THE COST OF GROWING APPLES

Every farmer and fruit grower should know how much it costs him to grow his apples in order that he may know how profitable they are. Unfortunately, few men keep an accurate record of the expenses from day to day and are able to tell with certainty at the end of the year just how much net income they have had from their fruit. In order to encourage fruit growers to keep more accurate records, a monthly expense sheet was devised in the Horticultural Division and is distributed free to any fruit grower who asks for it. A considerable number have taken advantage of this offer, and it is hoped that the appearance of a copy of this expense sheet in this bulletin will lead others to apply. (See p. 34.)

In the form are thirty-one columns. These are for recording the number of hours of labour that men and horses expend on the different operations day by day. To the right is a column marked "Total Hours for Month." In this record, the total number of hours spent on each operation are marked. Multiply this by the value of the labour per hour and put the resulting figures opposite the operation in question, but under the column marked "Cost of Labour and Materials."

Follow the principle in regard to the materials, recording the kind and amount used and date when used, placing, if it is wished, the value in the last column. When all items are entered, by adding them up the total expenditure for the month is obtained. At the end of each month a summary of each sheet should be recorded on the summary sheet and filed for future reference.

NOTE.—If the labour used varies in value, place the rate per hour at the top, and underneath put the number of hours worked each day. That is, find the average rate of wage each day and record it in the same place as you record your time. Thus, if on the third day of the month you have three men pruning, and one man gets twenty cents an hour, another sixteen, and another twelve, the average rate is 20, 16, 12, or sixteen cents per hour per day. This sixteen is placed under the column marked 3, but at the top and then a line is drawn and underneath is put the number of hours, say 20. The operation when completed looks like this , which means that 20 hours were spent at pruning and each hour was worth sixteen cents. Always record your hours on the basis of one man or one horse, i.e., if two men work ten hours each it is recorded as twenty hours.

A WEALTHY ORCHARD CLOSELY PLANTED

A small orchard of Wealthy apple trees was set out in 1896 at the Central Experimental Farm. This orchard was planted 10 by 10 feet apart and contained 144 trees, equivalent to setting out at the rate of 435 trees per acre.

The object of planting this orchard was to ascertain whether the planting of such early varieties as the Wealthy was a profitable undertaking or not. From time to time, as the trees became more crowded, certain of the trees have been removed in order to give the remaining trees ample space for development and growth. By planting an orchard in such a manner as this, a greater average profit per acre may be obtained than by placing the trees farther apart at planting and thus not utilizing all the space until later in the orchard's development. This practice, however, is only practical with such varieties as Wealthy, Duchess and Wagener, and varieties which make comparatively small-growing trees, bear at an early age and are normally used as fillers. In removing trees, the poorer-yielding ones, instead of the heaviest yielders, have been removed as far as possible, a detailed record having been kept of the annual production of each tree since 1899. Of the original 144 trees, 88 remained in 1915 and at the present time 64 are left.

The treatment of this orchard, which differs somewhat from the general practice, is to leave the trees in sod, keeping the grass cut and allowing it to

remain as a mulch. A heavy application of nitrate of soda, however, is made early in the spring each year.

Following will be found a statement of yields, expenses and profits for 1923 and the annual profit and average annual profit from date of planting (1896) up to, and including, 1924.

WEALTHY ORCHARD, 1923

Fruit picked.....			Gallons
Windfalls.....			935.5
			320.0
Total.....			1,255.5
			Estimates
			per acre
<i>Sales of Fruit:</i>			
397 baskets at 60 cts.....	\$	238 20	\$ 762 72
22 baskets at 50 cts.....		11 00	35 22
	\$	249 20	\$ 797 94
<i>Expenses, 1923:</i>			
Pruning, 1 man, 18 hours at 36 cents.....		6 84	21 90
Mowing, 1 man, 6 hours at 34 cents.....		2 04	6 53
Spraying and materials, 4 sprayings.....		4 80	15 37
Picking fruit, 36 hours at 34 cents.....		12 24	39 19
Picking fruit, 52 hours at 34 cents.....		17 68	56 61
419 baskets with covers at 7.4 cents.....		31 00	99 26
Rent of land.....		3 96	12 68
Total expenses.....	\$	78 56	\$ 251 54
Net profits.....	\$	170 64	546 39
	\$	249 20	\$ 797 93

WEALTHY ORCHARD 1896-1924

(Average net profit per acre from date of planting, 1896-1924)

Net profits per acre 1896-1904.....	\$	487 16
" " 1905.....		103 13
" " 1906.....		112 80
" " 1907.....		37 54
" " 1908.....		104 34
" " 1909.....		108 98
" " 1910.....		105 47
" " 1911.....		49 38
" " 1912.....		399 44
" " 1913.....		95 64
" " 1914.....		115 40
" " 1915.....		64 23
" " 1916.....		237 20
" " 1917.....		97 24
" " 1918.....		509 95
" " 1919.....		453 69
" " 1920.....		440 47
" " 1921.....		411 10
" " 1922.....		131 48
" " 1923.....		546 39
" " 1924.....		157 73
Total net profits per acre 1896-1924, 29 years.....	\$	4,768 76
Average net profit per acre from date of planting, 1896-1924.....		164 44
Average net profit per acre from date of fruiting, 1899-1924.....		183 41

VARIETIES

Of all the questions confronting an orchardist the question of the proper selection of varieties is probably the most important and, at the same time, the one most difficult of solution. The number of varieties of apples is legion and it is easy to make a wrong selection of the varieties to be planted. The different Experimental Stations have accumulated much information with regard to the fitness of varieties for commercial purposes and their suitability for various districts, but in the final analysis, the grower must make his selection to fit not only his climatic conditions, but the particular marketing situation he occupies.

In many parts of Canada, the hardiness or ability of the variety to withstand the climatic conditions is the primary consideration in determining the list from which selections can be made. Following this, the demands of the market are undoubtedly the next in importance. If catering to a foreign market only those varieties which are of comparatively good keeping and shipping quality should be considered and the ultimate selection based upon the popularity of the varieties in the prospective market. Notwithstanding all this, only those sorts which the grower knows will mature to perfection in his district should be considered, and the selection should be limited to not more than five varieties. The selection of a large number of varieties increases overhead cost in handling and adds to the difficulty of despatch in marketing. The selection of varieties, no matter how excellent or how well known, which reach only a state of mediocrity in the locality is a mistaken policy attended by indifferent results.

In the following pages a list of the better known varieties of apples is appended in alphabetical order, together with a discussion on the merits and demerits of the variety. These discussions are based on information obtained at the Horticultural Division, Central Experimental Farm, Ottawa, supplemented by information and suggestions received from the collaborators listed below. These men, all familiar with the commercial varieties of apples, have gone to much trouble to prepare memoranda on the comparative merits of these varieties, and an attempt to embody the various viewpoints of these workers is made in this bulletin.

Preceding the discussion on varieties is a list of recommendations for the various parts of Canada accompanied by a consideration of the special features peculiar to certain areas.

RECOMMENDATIONS BY DISTRICTS

LIST OF COLLABORATORS

Blair, W. S., Superintendent, Dominion Experimental Station, Kentville, N.S.
 Shaw, P. J., Provincial Horticulturist, Truro, N.S.
 Palmer, E. F., Director, Experiment Station, Vineland, Ont.
 Dickson, G. H., Assistant, Experiment Station, Vineland, Ont.
 Turney, A. G., Provincial Horticulturist, Fredericton, N.B.
 Neilson, J. A., Assistant, Experiment Station, Vineland, Ont.
 Hodgetts, P. W., Chief, Fruit Branch, Department of Agriculture, Toronto, Ont.
 Leslie, W. R., Superintendent, Dominion Experimental Station, Morden, Man.
 Palmer, R., Assistant, Dominion Experimental Station, Summerland, B.C.

NOVA SCOTIA

The province of Nova Scotia has long been famous for the production of apples. The Annapolis and Cornwallis Valleys have grown fruit since the time of the French occupation. Outside the large commercial fruit-growing areas contained in these valleys, apples are only grown in small numbers. The Annapolis and Cornwallis valleys are capable of growing practically any tree, so that hardiness is not, generally speaking, a limiting factor in these areas. On the other hand, those portions of the province outside the two valleys experience some difficulty in this respect, and hardiness has to be considered to a marked

degree. For the purpose of recommendations, therefore, the province is divided into two main areas, one area including only the commercial districts and the other all that portion of the province not included in these areas.

As Nova Scotia markets the bulk of its fruit in the Old Country, it is necessary to cater to the English market demands, so that the selection of varieties for home consumption is a factor of rather secondary importance, except in special cases where the grower has connections which assure him of a ready demand. The two greatest limiting factors in the Nova Scotia apple districts are colour and control of apple scab. On account of the latter, growers are often tempted to pass up high-class varieties which are susceptible to this trouble, but as scab can be controlled by proper spraying practices, this is a mistaken policy, to say the least. The question of colour, on the other hand, on account of a rather short growing season, precludes the selection of such sorts as Jonathan and probably Delicious, except in favoured spots, both of which are difficult to grow to perfection; and, unless so grown, competition with western stuff is disastrous to the grower.

RECOMMENDATIONS

Annapolis and Cornwallis Valleys.—Gravenstein, King, Baldwin, Spy, Golden Russet, McIntosh, Wagener, Cox Orange, Gano. Baldwin and King are not recommended for the heavy clay soils, where they grow greasy and do not colour properly. On lighter lands, however, they do excellently. For extended trial: Red Rome Beauty as a culinary apple for export.

Colder parts of Eastern and Northern Nova Scotia.—Crimson Beauty, Yellow Transparent, Astrachan, Duchess, Wealthy, Dudley, Alexander, McIntosh, Bethel, Fameuse.

For trial throughout the province: Melba and Lobo.

PRINCE EDWARD ISLAND

Prince Edward Island has never been considered a commercial apple district, but is capable of growing apples of high quality. Moreover, Bulletin No. 86 of the Central Experimental Farm says:—

“On Prince Edward Island, the summer and autumn varieties, especially, keep much longer than in most other places in Canada, Gravenstein and Wealthy, for instance, keeping well on into the winter, hence the term “autumn” for these as grown on Prince Edward Island may be somewhat of a misnomer.

RECOMMENDATIONS

Duchess, Wealthy, Alexander, King, McIntosh, Spy, Gravenstein, Golden Russet. For trial: Melba, Lobo.

NEW BRUNSWICK

This is one of the provinces comparatively new to the apple business, but with excellent opportunities for the future. As the climate is somewhat severe, hardiness becomes an important consideration in the selection of varieties. Fortunately, a few of our best varieties are sufficiently hardy for planting in New Brunswick, but until a few suitable winter sorts are found hardy enough for New Brunswick conditions, it is doubtful if this province will become a very large exporter to foreign markets. This, of course, depends upon the opportunities for McIntosh and possibly Fameuse on the British markets. For the Canadian market, New Brunswick should occupy an increasingly important position in the fruit industry.

RECOMMENDATIONS

Duchess (or Dudley), Wealthy, Alexander, Fameuse, McIntosh, Bethel (to a limited extent). McIntosh should be the main planting. For local use the

following might be considered: Yellow Transparent, Crimson Beauty, Red Astrachan. Melba and Lobo are recommended for extended trial.

QUEBEC

Quebec has for many years been the site of some fine, old orchards and, although not an exporter of apples, the province has been an important factor in supplying the home market. The Fameuse and McIntosh are two high-class varieties, which grow to perfection in the fruit districts of Quebec. The severe winters have limited the list of winter varieties to the poorer quality apples, so that Fameuse and McIntosh comprise the bulk of plantings. With an ever increasing home demand, Quebec offers excellent opportunities to the prospective orchardist.

RECOMMENDATIONS

District 1.—North to latitude 46 degrees and south to the American boundary in the western part of the province and east to the counties of Lotbinière and Dorchester, south of the St. Lawrence river; on the north side and within five miles of the St. Lawrence from about Three Rivers east to the island of Orleans; and then again south of the St. Lawrence river within a few miles of the river from Nicolet county to L'Islet county. Where there are high elevations or especially unfavourable conditions of soil, the varieties for District 2 would be the better to plant.

Melba, Duchess, Wealthy, Lobo, Alexander, Okabena, Fameuse, and McIntosh; Fameuse and McIntosh comprising the largest part of the planting.

For home use: Bethel, Golden Russet, Scott Winter, and in particularly favoured spots, Northern Spy.

District 2.—North of latitude 46 degrees, north of the St. Lawrence river; and south of the St. Lawrence river in the counties of Rimouski, Matane, and Gaspé.

Lowland Raspberry, Duchess, Wealthy, McMahan, Hibernial, Antonovka. Where apples will not succeed the following crabs are recommended: Whitney, Hyslop, Transcendent, Martha.

In the most northerly regions of the province, where even crabs may winter-kill badly, the following may be tried: Hybrid crab apples originated at the Experimental Farm, Ottawa, such as Jewel, Silvia, Charles, Osman and Columbia.

ONTARIO

This province for many years was the largest producer of apples of any province in the Dominion, but due to the passing of a large number of the so-called farmer's orchards, is rapidly taking a secondary position to both Nova Scotia and British Columbia.

As the province embraces several very good fruit districts of quite distinct conditions it has been divided into six districts by Macoun and separate recommendations made for each district. In addition to the recommendations made for the district, a general list is appended from which selections for commercial purposes may be made. This general list contains only the best varieties and when used in conjunction with the district lists and the descriptions should enable one to make a selection of the best five commercial possibilities.

RECOMMENDATIONS

District 1.—Counties north of Lake Erie.

Red Astrachan, Duchess of Oldenburg, Gravenstein, Wealthy, Blenheim, Tompkins King, Hubbardston, McIntosh, Fameuse, Rhode Island Greening, Baldwin, Northern Spy. Delicious for extended trial.

District 2.—Counties on Lake Huron and the southern part of the Georgian Bay and inland to Wellington and Waterloo counties.

Red Astrachan, Duchess of Oldenburg, Gravenstein, Wealthy, Alexander, Blenheim, Tompkins King, Rhode Island Greening, McIntosh, Fameuse, Baldwin, Northern Spy.

District 3.—Counties on Lake Ontario north to a line south of Lake Simcoe on the west and converging to Kingston on the east.

Duchess of Oldenburg, Gravenstein, Wealthy, Alexander, Blenheim, McIntosh, Fameuse, Rhode Island Greening, Northern Spy, Melba.

Additional varieties suggested for trial, home use or local market for districts 1, 2, and 3: Yellow Transparent, Pirmate, Ribston, Swayzie, Tolman, Rome Beauty.

District 4.—Counties of Wellington and Waterloo and the higher elevations in the adjacent counties.

Duchess of Oldenburg, Wealthy, Alexander, McIntosh, Melba, Fameuse. Other varieties such as Gravenstein, Blenheim, Ribston and Northern Spy will succeed in the most favourable parts, but it is safer to top-graft them.

District 5.—From near Kingston, north and east to latitude 46° and along this line west to and including Manitoulin Island, and south to District 3.

Yellow Transparent, Crimson Beauty, Duchess of Oldenburg, Langford Beauty, Wealthy, Alexander, Dudley, McMahan, McIntosh, Fameuse, Wolf River, Milwaukee, Bethel, Scott Winter, Melba, Lobo.

Okabena is promising. Scarlet Pippin succeeds well near the St. Lawrence river but is not hardy enough inland.

Additional varieties suggested for home use: Lowland Raspberry, Peach of Montreal, St. Lawrence, Pewaukee, American Golden Russet, Tolman.

While a few winter varieties are recommended for this district, extensive plantings of them are not advised.

District 6.—North of District 5.

Blushed Calville, Lowland Raspberry, Duchess of Oldenburg and Charlamoff, the two latter being autumn varieties in this district; Golden White, Antonovka, Wealthy, Hiberna, McMahan, Longfield and Patten Greening, all of which might be called early winter apples in this district. Where apples will not grow, the following crab apples should be tried: Whitney, Transcendent, Florence, Martha and Hyslop. Where the climate is most severe the hybrid crab apples originated at the Central Experimental Farm, Ottawa, such as Silvia, Jewel, Osman, Columbia and Charles should succeed.

Following is a list of the best commercial propositions, from which a selection can be made:—

Baldwin,
 Delicious (only under best conditions),
 Duchess (as a filler principally),
 Fameuse,
 Lobo (for extended trial),
 Melba (for extended trial),
 McIntosh,
 Northern Spy,
 Red Rome Beauty (where grown for export as a culinary apple),
 Scarlet Pippin (in Norfolk and similar counties),
 Wealthy (as a filler).

PRAIRIE PROVINCES

The Prairie Provinces, as a whole, have little prospect of becoming apple-producing centres, but as plant breeders continue to work on the problem the possibility of obtaining better varieties for the home garden becomes more probable. There is one area in Manitoba, however, which bears promise of becoming a fairly extensive fruit section for hardy varieties. This is the country



FIG. 19.

Young apple trees growing at the Experimental Station, Morden, Man.

around Morden in southern Manitoba, where the possibilities of apple orcharding have already been demonstrated. For this area the following varieties have been recommended.

Class I (Hardiest): Hibernial, Blushed Calville, Simbirsk No. 1, Anisette, Charlamoff, Patten, Pinto, Antonovka, Repka Kislaga, Lowland Raspberry.

Class II (Not quite as hardy as Class I): Ostrakoff, Duchess, Crusoe, Anis, Dudley, Haralson.

The following for trial in very favoured spots: Wealthy, Yellow Transparent, Red Wing, Pine Grove Red.

For the rest of the Prairie Provinces a selection should probably be made from the following crabs and hybrid crabs: Siberian crab, Red Siberian, Yellow Siberian, Columbia, Osman, Bedford, Silvia, Robin, Jewel, Dolga.

The following are not as hardy as those already mentioned, and in the most severe locations may not succeed: Transcendent, Hyslop, Wapella, Martin, Rosilda, Whitney, Piotosh.

BRITISH COLUMBIA

The province of British Columbia has increased its production of apples by leaps and bounds of recent years. Conditions in that province are somewhat different to any other part of the Dominion, owing to the low rainfall, creating in the best fruit districts conditions calling for irrigation. Under this irrigation system, however, British Columbia has been able to produce the highest quality of fruit and has proved its place in the world as a fruit-producing centre.



Fig. 20

Irrigating an apple orchard, Okanagan Lake district, British Columbia.

Owing to the numerous valleys of different altitudes and the proximity of some districts to the sea coast it is necessary to divide this province in numerous districts for the purpose of variety recommendations. The following districts and varieties are taken from Macoun's bulletin and from the experiences of the Dominion Experimental Stations at Summerland, B.C. and Sidney, B.C.

RECOMMENDATIONS

District 1.—Vancouver Island, southeast section.

Blenheim, Cox Orange, Duchess, Transparent, Grimes, Gravenstein, King, Wealthy, Melba.

District 2.—Vancouver Island, west coast.

Alexander, Charlamoff, Duchess, Gravenstein, King, Wagener, Transparent.

District 3.—Mainland, coast, northern coast valleys and lower mainland.

Alexander, Duchess, Wealthy, Transparent.

District 4.—Lytton, Lillooet, Spence's Bridge, Kamloops, Wallachin.

Duchess, Grimes Golden, McIntosh, Wealthy, Transparent.

District 5.—Southern central plateau, Shuswap lake.

Duchess, McIntosh, Wealthy, Transparent. Wagener and Northern Spy in favoured spots.

District 6.—Salmon Arm.

Duchess, Wealthy, McIntosh.

District 7.—Northern Okanagan, including Kelowna.

Duchess, Wealthy, McIntosh, Delicious, Rome Beauty.

District 8.—Okanagan Valley, south of Kelowna.

Jonathan (fillers only), Delicious, Rome Beauty, Stayman (Penticton, Summerland and Naramata only), Winesap (Osoyoos and Keremeos only).

District 9.—Similkameen, Kettle River, West Kootenay.

Duchess, McIntosh, Jonathan (as fillers), Wealthy, Transparent, Wagener (West Kootenay only).

District 10.—East Kootenay and Central British Columbia.

Charlamoff, Duchess, McIntosh, Wealthy, Transparent.

DESCRIPTIONS OF VARIETIES

Alexander (Synonyms Grand Duke Constantine, Beauty of Horton, Hare Pipka): Tree hardy, productive, subject to blight; fruit very large and poor in quality, but highly coloured, useful as a cooker; season late fall to January 1 under good conditions, should be picked from the middle to latter part of September. Not to be recommended for commercial planting, useful mainly for districts needing a hardy apple of this season.

Astrachan (Red Astrachan): An early summer apple of high colour and of little commercial value; does not ripen evenly and drops badly; hardy enough for the large fruit districts; tree is subject to canker; where grown for home market as a basket product may be recommended.

Anisette: A Russian variety almost identical with Duchess. (See Duchess).

Antonovka: A Russian variety, productive and very hardy; fruit yellow in colour, large size, almost good in quality; recommended for severe districts, such as southern Manitoba and severe parts of Quebec and Ontario, recommended as a cooker and has some value for dessert season September to October.

Arabskø (Winter Arabka): A Russian variety; tree not as hardy as Antonovka and other Russian sorts; fruit large, of a dark purple colour, poor in quality and of little commercial value; season early to mid-winter. Not to be recommended for future planting.

Baldwin (American Baldwin): The leading variety in parts of New York State and in southwestern Ontario for late winter market, also largely grown in Nova Scotia for the English market. A high-class culinary variety with small value for dessert; very high coloured when well grown; has not proved hardy enough for the Lake shore of Ontario where formerly grown to a large extent. On account of tenderness of tree, is subject to black heart, collar rot and disease. In unsuitable locations fruit is small, green and poor in quality. Recommended for districts where it does well. Tends to biennial bearing.

Baxter: A very hardy and vigorous tree; one of the few winter apples for eastern Ontario and Quebec; fruit of large size, attractive, with plenty of colour, but poor in quality. Not recommended for commercial planting, but of value for home use where better winter sorts cannot be grown.

Blenheim (Blenheim Orange Pippin): An English variety, well known in Nova Scotia and also to some extent in Ontario. Tree is vigorous and pro-

ductive, although in some places very unproductive; fruit, very large and attractive and fair in quality. Although it has proved fairly profitable for the British market, it is not recommended for future plantings. Tends somewhat to biennial bearing; fruit almost immune from black spot. Tree is slow coming into bearing.

Beautiful Arcade (Repka Kislaga): A Russian variety, tree very hardy and productive; fruit of good size, pale yellowish in colour, with pink blush; fair in quality; season August to September. Not recommended except for severe districts where hardiness is a limiting factor.

Blushed Calville: Another Russian variety, very hardy and productive, but not a vigorous or large grower. Fruit of good size, pale greenish yellow in colour with faint pink blush, not high in quality and shows bruises badly. Recommended anywhere where hardiness is essential. Season August to September. The leading commercial apple in the Morden district of Manitoba.

Bismarck: Origin New Zealand. Tree quite hardy, an early bearer and productive; fruit is attractive, being highly coloured when well grown, but rather poor in quality. Season December to February. Not recommended for commercial planting and not hardy enough for most severe districts.

Ben Davis: Probably the most debated apple in existence. Tree is quite hardy but not very vigorous and not hardy enough for eastern Ontario or Quebec, subject to collar rot and crotch injury. Fruit is of good size and very firm, making it an excellent shipper, high coloured and attractive in appearance and an excellent keeper, lasting longer than any other sort, poor in quality, being very dry and lacking in flavour. In the past it has been a profitable variety, but is not generally recommended for future planting on account of poor quality. Where an apple of this type is desired Gano is preferred.

Bethel: An apple of Vermont origin. Tree very hardy, vigorous and productive; the recommended late winter variety for eastern Ontario and Quebec for home use. Fruit is attractive, being a dark orange red colour, good size and firm, but lacking in quality. Not recommended for commercial planting on account of lack of quality.

Blue Pearmain: Tree is fairly hardy, vigorous, but rather a shy bearer. Fruit of a dark purplish colour, good size and fair in quality; season mid to late winter. Not recommended on account of shy bearing and on account of fact that it cannot compete with better sorts like Spy. Mainly of use in areas where Bethel is of value and taking everything into consideration is not as desirable.

Cox Orange: An apple of English origin. Tree rather weak and a poor grower, very subject to disease, fairly productive. Fruit is uneven in size, requiring thinning, of the very highest quality, delightful for dessert, rather attractive in appearance, being of the russeted type with a bright red blush. The highest-priced apple on the English market. Not hardy enough for the severe districts, but recommended where grown for export to England. Season mid-winter.

Crimson Beauty (erroneously named Early Red Bird): Originated in New Brunswick, probably the earliest summer apple known; tree very hardy and productive under most conditions. When well grown the fruit is high in colour, but ripens unevenly, requiring several pickings; fruit requires thinning to get even size; sells well on local markets on account of earliness and colour; very poor in quality. Recommended only for local trade, too soft to ship any distance.

Canada Baldwin: Originated in the province of Quebec; not to be confused with the Baldwin, which is an entirely different variety; tree is a strong grower, moderately productive and hardy, said to be subject to sunscald. Fruit

is attractive, highly coloured; season mid-winter. Although the quality is good it does not compete in the market with apples of the same season and cannot be recommended for general planting.

Charlamoff: A Russian variety. Tree very hardy, vigorous and productive; season earlier than Duchess, resembles Duchess much in appearance, quality is good for dessert, much better than Duchess; too soft to ship and does not keep well. Where grown for local trade may be recommended for planting.

Cranberry Pippin: This variety originated near Hudson, N.Y. Tree a strong grower and productive, not hardy enough for eastern Ontario. Fruit is large and attractive with considerable colour on one cheek. Season early to mid-winter; not high enough in quality. Not recommended for future planting.

Cortland: This is a new variety, a cross between Ben Davis and McIntosh, originated by Hedrick of the Geneva Experiment Station. Tree is of doubtful hardiness for eastern Ontario, but satisfactory for other districts, said to be vigorous and productive; fruit attractive, highly coloured and high quality; said to keep a month longer than McIntosh. At present can only be recommended for extended trial.

Delicious: Probably the best advertised apple in the world. Origin Iowa; tree appears to be fairly hardy, but as this variety is only just coming into bearing in Ontario, not enough is known to recommend it without reservations. The fruit when well grown is very large, highly coloured and of superb quality. In season it is mid to late winter; a good shipper and fit only for dessert use. In New York, growers are finding it a little difficult to grow to perfection as it appears to fall off in size on older trees. In British Columbia, under irrigation, it reaches a high degree of perfection. It should prove profitable for southern Ontario in the best-cared for orchards. Of doubtful value for Nova Scotia on account of the critical demands; probably not hardy enough for eastern Ontario and Quebec. Considered a shy bearer.

Dudley (North Star): Origin Maine; tree very hardy and a strong grower, but is liable to break down badly unless very carefully handled; fruit is large, attractive and of good quality, but as it is similar in season to Wealthy, is generally passed by in the markets in its favour. As it bears early and is not a large tree, is useful as a filler. Preferred in New Brunswick to Duchess both as a standard and as a filler. Not recommended for other provinces, except where hardiness is a vital factor, unless used as a filler variety.

Duchess: A Russian variety. Tree is very hardy, vigorous and not very large. As it comes into bearing early it is a leader as a filler variety. Subject somewhat to collar rot and occasionally to fire blight, sunscald and crotch injury. In season it is mid to late summer and is a very popular apple on local markets. Considered one of the best for culinary use, especially for baking. Fruit of good size, attractive and well coloured, poor for dessert; if thinned much colour and size can be obtained. Recommended for fillers in all sections as a local market apple and for standards in the severer districts; not an export apple. In New Brunswick, Dudley is recommended to replace Duchess. This variety succeeds well in southern Manitoba so has a very wide range of adaptability.

Early McIntosh: This is a new variety of the McIntosh type, originated at the Geneva Experiment Station, New York. As it has not been tested in Canada as yet, little can be said concerning it. Tree is said to be vigorous and productive; fruit is medium size, attractive and of good quality; in season it is about the same as Duchess, but much superior to it in quality.

Fallawater: Tree is a vigorous grower, but often short-lived, fairly productive, not very hardy. Fruit is very large, dull in colour and not very attractive, drops badly. Of use only as a culinary. Not recommended for future plantings. Subject to collar rot.

Fameuse (Snow apple): Tree is vigorous and moderately productive, not quite as hardy as McIntosh, but hardy enough for eastern Ontario and Quebec, subject slightly to collar rot in some locations. Fruit is very attractive and high in colour, especially the bud sports (Jones' Red Fameuse and others), which are preferred on account of their higher colour. In quality it is excellent, being a very high-class dessert apple, very popular for the early Christmas trade and probably the highest-priced apple on the Canadian market; suitable for box packing when well grown. Subject to scab requiring the best of spraying. Strongly recommended for Quebec and Ontario growers.

Gano: This is an apple of the Ben Davis type and not to be distinguished from the Black Ben Davis. It is really a highly coloured Ben Davis. The tree is fairly hardy and a strong grower and is generally an annual and productive bearer. The fruit bears all the characteristics of Ben Davis with the added attractiveness of a higher colour. It is now recommended in place of Ben Davis in Nova Scotia, although many consider it should be relegated to the past along with that variety, on account of its poor quality. As long as good prices are paid for the fruit it will probably continue to be planted, although one of our collaborators considers both these varieties about as useful as turnips.

Golden Russet: Tree quite hardy, in fact, grows well in favoured parts of Quebec and eastern Ontario. A large tree, long-lived, but rather a slender grower; not productive under some conditions, and requires heavier feeding than most varieties. The fruit is not large, being of dessert size. Essentially a dessert apple for the mid-winter market; carries well and is a good keeper; very popular on the English market where it brings a good price. Highly recommended for the eastern counties of Ontario along the Lake shore and for the Annapolis and Cornwallis valleys as an export apple.

Gravenstein: Originated in Germany. Tree a very vigorous grower, but not entirely hardy; subject to many ills, such as collar rot, crotch injury and canker; should be top-grafted on hardier stock. Fruit of good size and very attractive. The bud sports of this variety are preferred. They are: Banks' Red and Crimson Gravenstein. Late fall in season, quality good, useful both for dessert and culinary purposes, very popular on the English market. Recommended for the favoured parts of Ontario for home use and the bud sports for Nova Scotia as a commercial proposition.

Grimes Golden: A West Virginia variety, which was very popular in previous years, but has been gradually eliminated from Canadian orchards. Tree is not very hardy and as the fruit is yellow it is not favourably looked upon for commercial planting. On account of the high quality of the fruit it might be considered in a home orchard. Fruit bruises easily and is subject to scald.

Hibernal: This apple can hardly be considered a commercial proposition in the fruit districts, but has a place in such spots as southern Manitoba. It is extremely hardy in the tree and a vigorous grower. The fruit is poor in quality and useful mainly for culinary purposes. As a hardy stock variety it may be highly recommended, although its seedlings have been very disappointing in this respect.

Hubbardston: An old favourite for an early winter apple, but not now sufficiently popular to warrant new plantings. The trunk of the tree appears weak as it is subject to canker to a considerable extent, otherwise moderately hardy. Fruit is attractive and of good quality.

Jonathan: This is essentially a western apple of high dessert quality; for box-packing. Being a late keeper and a good shipper it has become a very popular variety. On account of the fruit being subject to many physiological disturbances, such as bitter pit, core rot and breakdown it is not being so largely planted in the west as formerly. It is gaining favour in southern

Ontario and may be recommended for the best orchards in that part of the country. The tree is not hardy and should only be planted in the most favoured spots. The fruit is highly coloured and of top quality, but being heir to many troubles, is a proposition only for the most careful growers.

King (Tompkins King): One of the most popular early winter sorts in the east and one of the greatest money makers. Tree is a rambling vigorous grower, a little on the tender side, being subject to collar rot, which can be overcome by top-working on hardier stock, also subject to blight. It is inclined to shy bearing, but produces large handsome fruit of high quality; a good keeper and shipper. On the heavier soils it does not produce as attractive fruit as one would like, except where the season is long. Still recommended for districts where it thrives.

King David: This handsome fruit is borne by a vigorous, prolific tree, which appears to be hardy enough for points in Ontario outside the eastern and northern sections. Fruit is very dark red, but appears to be too lacking in size to make it an attractive proposition. Not recommended for commercial planting.

Lobo: A new variety originated at the Central Experimental Farm, Ottawa. A seedling of McIntosh, which resembles its parent very much in colour and quality. The fruit is in season earlier than McIntosh and a little later than Wealthy, but keeps under good conditions almost as long as McIntosh. The tree is hardy, vigorous and productive and bears at an early age. The fruit hangs to the tree better than McIntosh and it is a more persistent bearer. In quality it is not quite as good as McIntosh but is fully equal to it in appearance. Recommended for Eastern Ontario and Quebec and for extended trial in other districts.

Lowland Raspberry (Liveland Raspberry): A Russian variety of considerable merit, especially for the severer districts. The tree is a vigorous grower, very hardy and productive. The fruit is inclined to be a little small, but is attractive and is high in quality for an early apple, being from mid to late August in season. Recommended for home use and local market.

McIntosh: This apple has made history for eastern Ontario, where it was originated, and is undoubtedly the most popular apple in Canada to-day. It has a very wide range of adaptability, doing well in British Columbia, Ontario, Quebec, New Brunswick and Nova Scotia. The tree is vigorous, very hardy and fairly productive, generally producing annual crops. The fruit is a beautiful, almost solid, red, with exceptionally high quality for dessert use; a winner as a boxed apple. Commands a premium on home markets and is increasing in popularity on the English markets. The fruit scabs easily, calling for the best spraying methods, and drops badly, this being its worst fault. Recommended for British Columbia, Ontario, Quebec, New Brunswick and favoured parts of Nova Scotia as an early winter variety.

McMahan White: Aside from its hardiness and culinary value, this variety has little to recommend it. The tree is very hardy and vigorous and a good cropper. On this account it is recommended for planting in the more severe districts, where it is valued as a good cooker. The fruit is a pale yellow with a faint pink blush, and is of good size. Season October and November.

Melba: This new variety, a seedling of McIntosh, fills a long felt need for an early apple of Duchess season and McIntosh quality. The tree is vigorous and hardy, an early bearer and a good cropper. The fruit is large, well coloured and attractive and of the highest dessert quality. A good keeper for an apple of that season and should ship well to home markets. Recommended for planting both as a filler and as a standard where an early apple of dessert quality is required for local use.

Milwaukee: This variety, a seedling of Duchess, is one of the hardy, early winter sorts. The tree bears at an early age, is a vigorous grower, and productive. It is, however, rather a poorly shaped tree and requires careful pruning. The fruit is large, but lacks in appearance and is poor in quality. Not recommended where a better apple of the same season can be grown. Its only value would be for culinary purposes.

Montreal Peach: Sometimes simply called the Peach apple; is an excellent variety for the farm orchard. In season it is late summer, about September 1st. The tree is hardy and productive. The fruit is light yellow with a faint pink blush, possessing very good dessert qualities, but too soft to keep or ship any distance. Recommended only for very local use as an early dessert variety.

Newtown (Yellow Newtown): An apple which has helped to make Oregon growers, but which has little place in Canadian orchards. In the southern part of British Columbia it is grown to some extent, but is a shy bearer and not recommended. It meets with a ready market demand abroad, but is one of those varieties best left to the Oregon growers, although recommended for southern Ontario by J. E. Johnson, because it sells at the top price in England. It is a greenish yellow apple without much colour and is essentially a dessert fruit. Tree is not hardy enough for the severer districts, and the Nova Scotia season is too short for it.

Nonpareil (See Roxbury Russet).

Northern Spy: The apple for which Ontario as a fruit producing province has become justly famous. Despite the fact that the tree takes years to come into bearing, although afterwards productive, it is doubtful if we will have for years to come a late winter apple to replace Spy. The tree is not hardy for the severe districts, but is capable of being grown in the best fruit areas of Ontario, British Columbia and Nova Scotia. It is a very vigorous grower and requires lots of room. Being a bit particular in its soil requirements, to attain the highest quality it should be planted only in districts where it has previously done well. It excels both as a culinary and dessert variety and should form part of any orchard in the real apple-producing districts where it is recommended. The fruit lacks sometimes in colour and requires careful growing.

Northwestern Greening: This variety, although well known in some of the States, hardly has a place in Canadian orchards. As a Greening it is not to be compared with Rhode Island Greening, and possesses the great fault of going bad in the centre when apparently in perfect condition from outside appearances. The tree is hardy enough for the severe fruit areas, but is not recommended for future plantings.

Ontario: At one time much planted, but of late years not recommended. It is of Canadian origin and is the result of a cross between Wagener and Spy. The tree is moderately vigorous, but not hardy enough for the severe districts. It is an early and heavy bearer. The fruit is fairly good in quality and keeps to late winter, but shows bruises too badly to be considered as a commercial proposition in future plantings.

Okabena: This is a comparatively new variety with a limited sphere of usefulness; appears to do well in Quebec as an early fall variety. The tree is hardy and productive and the fruit is very attractive with its wash of deep orange red. The quality is fair and for districts requiring a hardy fall sort for the home trade, it might be recommended in limited quantities.

Pewaukee: A variety with very little to recommend it. Tree is not extremely hardy and the fruit is poor in quality and appearance. Not recommended for future planting.

Roxbury Russet (Nonpareil): This is a late winter russet apple of old-time fame. It is not now being recommended to any extent. The tree is a very vigorous grower and is productive if not planted in too large blocks, as it is considered self-sterile; tends to biennial bearing. The tree is very subject to canker and it is difficult to keep it free from this trouble. Not recommended for future planting. Golden Russet is a better money-maker and more popular on the foreign market.

Rainier: A variety grown for many years in the State of Washington and one which has been coming to the fore of late. Little can be said of it with regard to Canada, as it has not been tested. The tree is vigorous in its native clime, but we know nothing of its hardiness. The fruit is handsome, of very high colour and good in quality. Season from December to April.

Ribston: Another popular variety of years past which is gradually falling into oblivion. The tree is healthy, fairly hardy, vigorous and productive. The fruit is of the Blenheim type, rather attractive and high in quality. As it has not brought good prices recently is not recommended for commercial planting. Season is late fall.

Rhode Island Greening: An old stand-by which we are reluctant to let go. As the market at present appears to be demanding a higher-coloured fruit it has rather been passed by in new recommendations. The tree is a strong grower and productive; not hardy enough for the severer districts. The fruit is excellent for culinary use and considered by P. W. Hodgetts* to be Ontario's best cooker; is also a fair dessert apple. Tender east of Toronto, but recommended, where it will grow, for future plantings by Palmer of Vineland and Hodgetts of the Ontario Fruit Branch. Not being recommended for Nova Scotia on account of lack of colour.

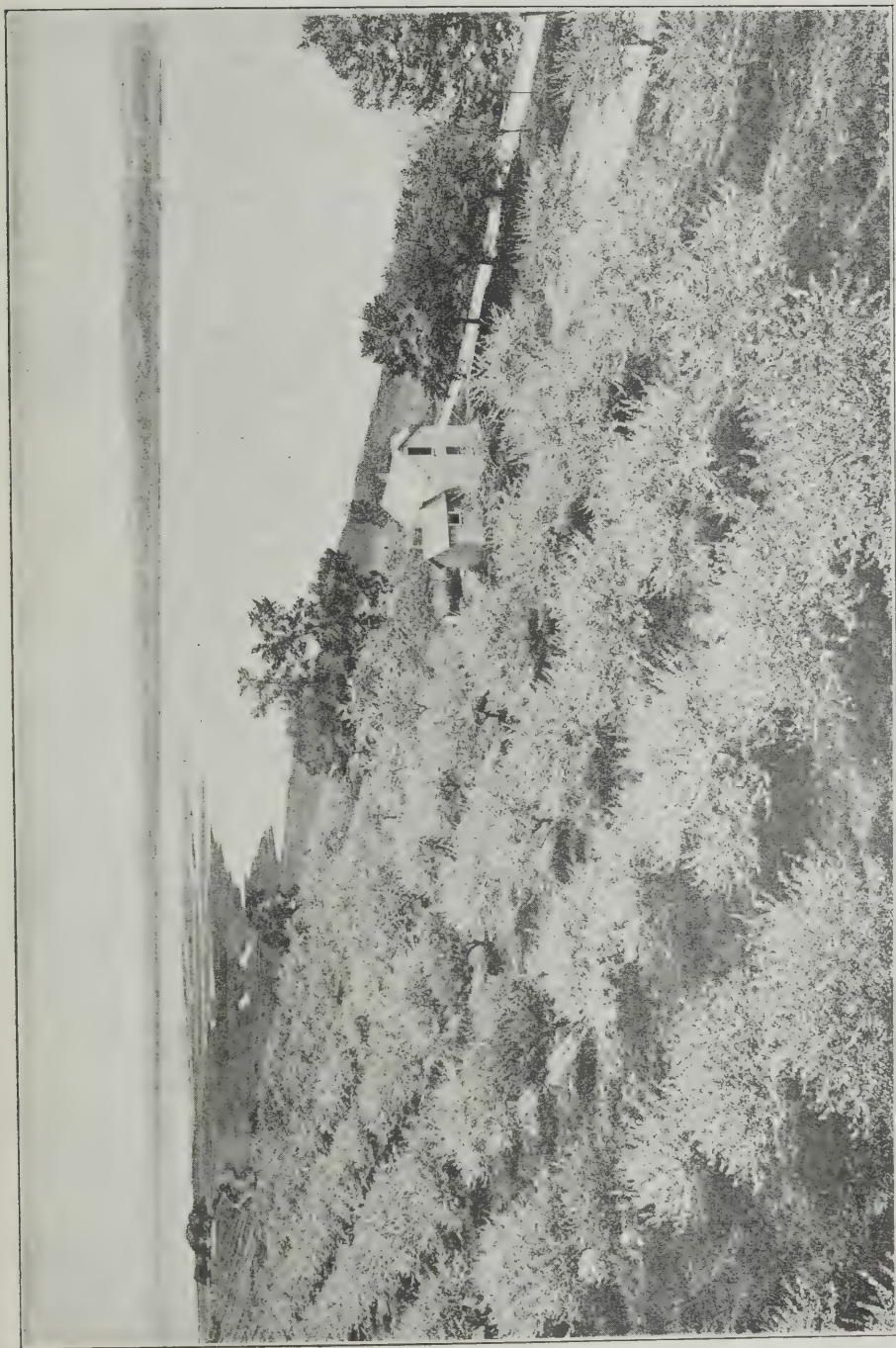
Rome Beauty: A comparatively new apple which has produced several bud sports of a deeper colour. These bud sports appear to have some promise in Nova Scotia as a cooking apple for export, and are highly thought of in British Columbia. The tree, while hardy enough for there, is a weak grower and not quite suitable to eastern Ontario. The fruit, while highly coloured, is rather poor in quality and inclined to be a little small, but is a very late keeper. Not recommended outside British Columbia and in Nova Scotia, where it may be useful for trial purposes.

Scarlet Pippin: A variety growing in favour as a late fall apple in Ontario. Somewhat earlier than Fameuse but keeps almost as long as McIntosh. The tree is about as hardy as Fameuse and is a fairly vigorous grower and productive. The fruit resembles Fameuse in texture and appearance somewhat, and is of very high quality. Has been planted freely in Norfolk county, Ontario, and is recommended for future plantings in that part of the country as an early fall variety for dessert purposes.

Scott Winter: This is a very late-keeping apple or winter variety which has been recommended for the severer districts for want of a better apple of that season of sufficient hardiness. The tree is very hardy and a fairly vigorous grower. The fruit is inclined to be too small and not particularly attractive. In quality it is acid and must be classed as poor. Aside from its hardiness and late-keeping quality there is little to recommend it, and where a better variety will survive, is not worth planting commercially. At best a culinary variety.

Spitzenburg: The tree of this variety is a rather slow grower and somewhat subject to canker, so is not considered very vigorous. It is a winter variety, attractive in appearance and good in quality. Not much planted and not recommended for Canadian orchards on account of lack of hardiness.

* Chief of Fruit Branch, Department of Agriculture, Toronto, Ont.



Apple orchard in bloom, Nova Scotia.

St. Lawrence: There are two varieties under this name, the Fall St. Lawrence (St. Lawrence proper) and the Winter St. Lawrence. The former is an exceptionally fine apple in quality and is fairly hardy, but on account of its shy bearing habit has not become very popular and for that reason is not now recommended for commercial orchards. The Winter St. Lawrence, although a high-quality apple, is not a sufficiently good keeper to consider as a commercial proposition.

Stark: An apple which has probably been largely over-planted and should be approached tender with caution. At best it is a culinary apple, and although it brings a fairly good price, other varieties are bound to replace it. The tree is very vigorous and hardy enough for the large fruit districts in Nova Scotia and western Ontario. In most areas it is a poor, dull-coloured variety and does not compete with a good Baldwin. Can only be recommended where it colours well and then with some considerable reservations.

Stayman (Stayman Winesap): Not to be confused with Winesap. The tree is relatively tender and has narrow planting limits. Grown to some extent in the southern Okanagan where it seems to have a place. The fruit is large and fair in colour. Good in quality, but inferior to Winesap, and does not keep as well; subject to blossom-end scab which may cause loss of crop, as infected blossoms drop. Not generally recommended.

Transparent (Yellow Transparent): An old favourite for a summer variety. Bears when quite young and is useful as a filler for that reason. The tree is hardy, vigorous and productive. Fruit is yellow in colour and of good size, with fair quality. As it is a poor shipper, is fit only for local use.

Tolman Sweet: Of all the sweet apples on the market, this one probably occupies top place. The tree is hardy and makes an excellent stock for more tender sorts. As the market for sweet apples is limited, it should only be planted on a small scale. The fruit is not attractive, being poor in colour.

Wagener: One of the filler type, as it is a very early bearer and a small tree; not very hardy and quite subject to fire-blight; much thought of in Nova Scotia, especially as a filler, where it is a winter apple. Outside Nova Scotia it is questionable if it should be recommended, and then only as a filler. The fruit is attractive. It prefers elevated well-drained sites.

Wealthy: Another apple very popular over a large area, especially as a filler. The tree is a strong grower, but requires careful handling as it breaks down easily. Bears at a very early age and is most productive. A confirmed biennial bearer. In season, the fruit is mid fall. It is remarkably resistant to scab, highly coloured, of fair size and very attractive. By thinning the size can be greatly increased. Fair in quality and well known on the market. Recommended for the most severe districts and in general as a filler variety.

Winesap: A very popular dessert variety of long keeping quality, with high colour and attractive appearance. Grown somewhat in British Columbia in the southern Okanagan, but is not recommended for other parts of Canada.

Winter Banana: On account of its handsome appearance this variety has attracted some attention from nurserymen and growers. The tree is hardy and vigorous, but as the fruit, which is rather handsome, shows bruises badly, it is not recommended for commercial planting. It will never be among the leading varieties, although in quality it is fairly good and is a late winter apple.

Wolf River: One of the largest apples grown. Although poor in quality as a dessert variety, it is a surprisingly excellent baking apple. The tree is hardy and vigorous and suitable for severe districts. The fruit is late fall in season and attractive in appearance. Probably sufficiently planted, but still recommended in limited quantities for severe districts, as eastern Ontario, etc.

Yellow Bellflower (Bishop Pippin): A very high-quality dessert winter apple, but altogether too soft for shipping, as it shows bruises badly. Not planted for commercial purposes, but recommended for home orchards.

CRAB APPLES

Crab apples are generally very popular on the large city markets for preserving and jelly-making purposes. Most of our crabs are extremely hardy and will grow in the most severe districts, with the exception of some locations on the prairies, when it becomes necessary to resort to some of the Saunders hybrid crabs mentioned later. Of the large number of crabs which are on the market only a few are here mentioned, these being the outstanding commercial varieties.

Hyslop: A medium to large-sized crab; very thin, tender skin; yellow flesh, moderately juicy. It is very hardy and productive and one of the best-keeping crab apples we have. Deep crimson in colour with a yellow ground, making it very attractive. A very profitable crab to grow.

Martha: A well-known crab, originated by Peter Gideon, Excelsior, Minn. The tree is very hardy, vigorous and productive. The crab is large and handsome, being very highly coloured; probably not as good a jelly-maker as *Hyslop* and *Transcendent*, but considered to be one of the best crab apples.

Transcendent: One of the best known crab apples on the market; very handsome in appearance, being of a rich yellow colour well washed with orange. Tree is somewhat subject to fire blight, but otherwise hardy and productive.

DR. SAUNDERS' HYBRID CRABS

These crabs are divided into first and second crosses. The first crosses are the result of crossing *Pyrus baccata*, a red Siberian crab, with cultivated varieties of apples, such as McIntosh, Wealthy, etc. The resulting fruit is about the size of a small-sized crab apple and is much hardier than most of the crab apples we have. Two of the hardiest, according to tests given at the various Experimental Farms on the prairies, are Osman and Columbia. Both of these appear to be able to withstand the severe temperatures of the open prairie and to come to a fruiting age with practically no winter injury. They are recommended where crab apples of a better kind will not grow.

Of the second crosses there are several that are very outstanding in quality and appearance, but little is known as yet regarding their suitability to prairie conditions. They are now under test at the various Experimental Farms and at other points throughout the western provinces, and information should be shortly forthcoming as to their relative merits. The most outstanding of these are Rosilda, McPrince and Printosh, all of which are very handsome and of good quality, in fact almost good enough to be classed as edible apples.

PUBLICATIONS ON THE APPLE

The following publications of the Department of Agriculture relating to the apple and apple growing are available on application to the Publications Branch, Department of Agriculture, Ottawa:—

Modern orchard practices.. . . .	Bul. 18, N.S.
Renovation of neglected orchards.. . . .	Bul. 79, E.F.
Protection of fruit trees from mice and rabbits.. . . .	Ex. Cir. 17.
Modern methods of packing apples.. . . .	Bul. 2, F.B.
Canadian-grown apples.....	Bul. 35, N.S.
Size and colour minimums.. . . .	Cir. 16, N.S.
Control of the European apple sucker.. . . .	Pam. 45, N.S.
Apple maggot and its control in Quebec.. . . .	Cir. 28, N.S.
Orchard scale insects.. . . .	Cir. 37, N.S.

A full list of the publications relating to apple growing and orchard practices may be obtained by writing for the List of Publications.

